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MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

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AUGUST 1992 VOLUME 120, NUMBER 8

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

FEATURES

ABOVE: *at the Second Unlimited Races, intense concentration is apparent on the Gold flight line. Photo by Rob Wood.*

ON THE COVER: *Miss America, which took 3rd place in the Silver class at the Second Unlimited Races, is shown on approach with gear down (see feature coverage). Photo by Rob Wood.*

HELICOPTER SECTION

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 251 Danbury Rd., Wilton, CT 06897. Second-class postage paid at Wilton, CT, and at additional mailing offices. Subscription rates are: $24.95 for 1 year (foreign, $34.95); $45.95 for 2 years (foreign $65.95). **Postmaster:** send Form 3597 to **Model Airplane News,** P.O. Box 428, Mount Morris, IL 61054.

EDITORIAL

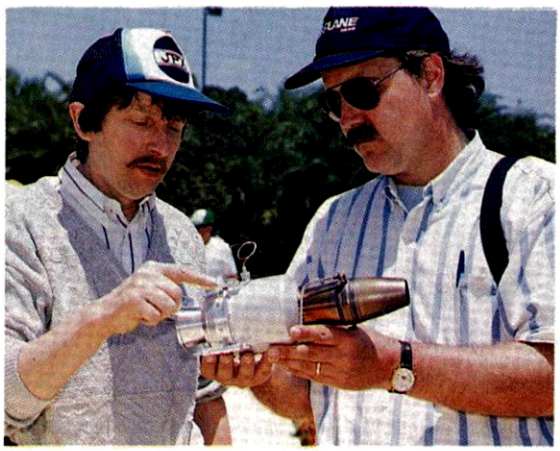
TOM ATWOOD

TOWARD EXPANDING THE HOBBY

A powerful argument can be made that if we doubled or tripled the number of participants in the sport of aeromodeling, all would gain. Benefits would include a greater diversity of R/C products and lower costs to the consumer as manufacturers increased production. Many recognize the need to bring more young people into the hobby. Without exception, when I've given a younger person a chance to see or fly an R/C airplane, the response has been one of excitement and interest. It has been reported that the involvement of youngsters in aeromodeling is associated with scholastic improvement; if you think about it, the benefits of expansion would extend far outside the hobby.

What are the best ways to catalyze greater involvement of young people? Frank Heinrich, VP and general manager of Robbe Model Sport, USA, recently described to me successful, decades-old programs in Germany. They're an integral part of the marketing strategies of such companies as Graupner, Robbe and Simprop. The German Aeronautic Club (DAeC), and a second such organization, the Model Pilot Association (DMFV), sponsor modeling clinics for school teachers twice yearly. Rough equivalents to AMA district VP's run these clinics seasonally. Kits can be purchased in bulk by teachers (e.g., 30 glider kits packaged in a single box with one or two sets of plans) at approximately half the price. Frank says these programs involve the sales of literally tens of thousands of kits each year in Germany. Students who get involved can compete in contests for prizes that may include R/C equipment, trips to other countries, rides in gliders, etc.

These aeromodeling contests are publicized not only in modeling publications, local hobby shops and in club newsletters, but in local newspapers. They're also PR opportunities for manufacturers, who feature winners in advertisements. Frank noted, "Kids who play Nintendo are consuming a dream, but when they get involved in R/C, they're creating their dream." Here, they get a chance to learn responsibility, sportsmanship and perhaps technical areas that they may later wish to pursue professionally. Frank also pointed out that an inexpensive R/C radio can be bought for approximately the cost of two Nintendo cartridges. After kids have learned about R/C modeling from the teachers, they tend to migrate to local clubs.



J. Buchoux (left) of JPX—a French company—and Editor-in-Chief Tom Atwood discuss JPX's revolutionary Turborec T240 propane gas-powered turbine. It made history when it was flown at the 1992 Top Gun Invitational (see next issue). Photo by John Jundt.

IN THE U.S.

There are some notable examples in this country, too, although they're still too few in number. Estes/Hi-Flier involves 35,000 schools in model rocketry. Rocket clubs exist at many of these schools. Jane Love, director of marketing, told me that Estes provides "teacher kits" that facilitate the introduction of model rocketry to the classroom. One kit targets fifth- through eighth-grade levels. Another program, for high schools, provides teachers with material that integrates model rocketry, math, science and social studies.

Estes has been working with school systems for about 35 years and considers this involvement to be a cornerstone of its success. Today, Estes goes to regional and national teachers' conventions and publishes the "Estes Educator News." As in Germany, bulk-pack programs allow teachers to buy rocket kits through the distributor, retailer, or direct. Estes' program seems a good model for the R/C industry.

Midwest Products has conducted a school-oriented Delta Dart program since the 1970's. Frank Garcher, president, recently told me that Midwest touches about 14,000 of the 130,000 schools in this country that teach the fourth through 12th grades. Midwest sends catalogues of model projects, including the Delta Dart, to the schools. Midwest also provides retailers, through the National Retailer's Hobby Dealer Association (NRHDA) a program called "Grow a Modeler." It provides class packs and literature that can be sold through a retail store so that the retailer can work with both the teachers and school systems

Frank comments, "The name of the game is exposure, and the more we can expose to R/C, the better it will be for the industry." He offers an interesting example: if the 2,600 R/C clubs in this country each held a one-year program in which they put on an exhibition for 10 schools, and if each school brought 50 students, then 26,000x10x50=1,300,000 students would be given a chance to see R/C in action. Midwest is now consulting with German companies involved in R/C modeling teacher programs.

PRODUCTS

R/C products that lend themselves particularly well to school programs will also help bring youngsters into the hobby. Dave Abbe, CEO of RCD, is developing the "Tadpole," a rubber-powered, 2-channel R/C plane slated for release in '93. All-up weight, including radio, battery and control-surface actuators, will be approximately 1.5 ounces. It's expected to be within the budget of many younger buyers.

Will any of the major modeling organizations exercise the leadership necessary to bring more programs such as those noted above into being? Will U.S. companies view this type of activity as integral to their marketing, as do their German equivalents? We hope so, because we believe all would benefit.

MODEL AIRPLANE NEWS
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SUBSCRIPTION PRICES: U.S. & Possessions (including APO & FPO): 1 year (12 issues), $27.95; 2 years (24 issues), $49.95. Outside U.S.: 1 year, $37.95; 2 years, $69.95. Payment must be in U.S. funds.

SUBSCRIPTION INQUIRIES: call 1-800-827-0323.

MODEL AIRPLANE NEWS (ISSN No. 0026-7295) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut. Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone: 203-834-2900. FAX: 203-762-9803. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. DeFrancesco, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional Mailing Offices.

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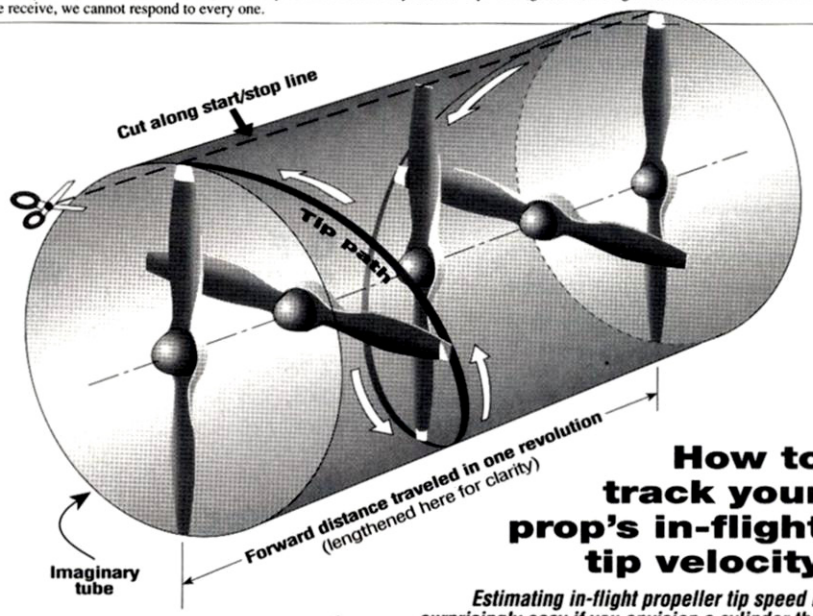
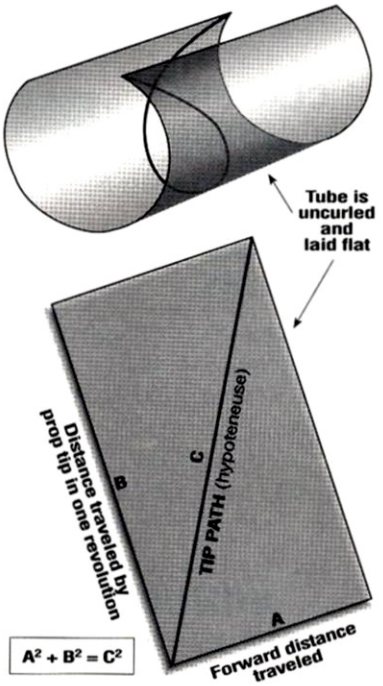
AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremen dous numbers of letters we receive, we cannot respond to every one.



How to track your prop's in-flight tip velocity

Estimating in-flight propeller tip speed is surprisingly easy if you envision a cylinder that represents propeller travel, cut the cylinder open and uncurl it as if it were a piece of paper.



SUPERSONIC PROPS?

After a 35-year hiatus from model airplanes, I'm back in the hobby. The changes in the industry are incredible. I remember the old pulse systems, etc. I'm a professional pilot (U.S. Customs). Among the aircraft I fly is a Beech King Air B-200, which is powered by a Pratt & Whitney PT6-41 turbine engine. It develops 750 shaft horsepower at takeoff. The propeller on this engine turns at a maximum takeoff rpm of 2,000, while the gas turbine turns at about 35,000rpm. Cruise rpm is 1700. This gives the King Air a true air speed of about 230 knots at altitude. Another aircraft I fly is a Cessna Turbo 210. This aircraft puts out a takeoff rpm of 2,700.

My question is this: the full-scale aircraft I fly turn their props so much more slowly than the model props. The object of the 210 and the King Air is to keep the prop tips out of the supersonic range. Big Continental and Lycoming piston engines, unless they're geared down, have their prop tips going through the speed of sound on takeoff. I've been taught that a propeller loses efficiency when it goes supersonic. Why are the model engines not geared down to get greater prop efficiency? Perhaps there's a simple answer to this that I'm just not able to figure out.

I really enjoy your magazine. I think it's the best on the market. Keep up the excellent work.

JIM MILLER
Albuquerque, NM

Jim, R/C model propellers, as a general rule, don't generate supersonic tip speeds, which is why gear drives are rarely seen on glow-powered models. A simplified example from Andy Lennon illustrates this. If we assume a 10-inch diameter prop, then the circumference the prop tip circumscribes in a single revolution is: 10 inches (the diameter) times 3.1416 (pi) = 31.4 inches. If that prop is spinning at 10,000rpm, the tip travels a distance of 314,000 inches in 1 minute. Dividing that

number by 12 shows that the tip travels 26166.66 feet per minute. Multiplying that number by 60 tells us that in an hour, the tip would travel 1,570,000 feet. Dividing by 5,280 feet to see what this is in mph indicates a prop tip speed of 297.35mph. Using the same analysis, an Enya .49 spinning a 10x6 prop at 16,000rpm would result in a tip speed of 476mph. The speed of sound, of course, is approximately 720mph.

The formula noted above doesn't include the forward speed of the aircraft. As the spinning prop moves forward through the air, each blade tip "draws" a line on the inside of an imaginary cylinder. Imagine taking a length of that cylinder that equates to one full revolution of the prop, and cutting a straight seam along the side from where the prop starts to where it completes a revolution. If you then uncurl and flatten out the cylinder section, you will have a flat "piece of paper." You'll find that the "arc" cut by the prop tip is a straight line.

The path traveled by the prop tip is the hypotenuse of a right triangle. As we know from geometry, the square of the hypotenuse is equal to the sum of the squares of the other two sides. By solving for the length of the hypotenuse and using it as the distance traveled in a single revolution, you can estimate the actual prop-tip speed during flight. Nonetheless, the simplified approach noted above, which assumes the engine and prop are mounted on a test stand, gives one a good picture of what's going on.

Larger props are now being used by the 100-inch unlimited racers. Will they be bumping up against the sound barrier? At the unlimited race held in Tucson, Klaus Nowak of Aerrow, Inc. showed an A200S gas-powered opposed twin that could spin a 24x20 prop at 7,000rpm, static. Using the simplified formula, this equates to a tip speed of 500mph. When a plane flies through the air, the relative wind felt by the prop airfoil changes as the plane increases speed, and this results in a net reduction in the prop blades' angle of attack. This, in turn, reduces the drag on the prop, which consequently "unloads" and spins faster. Given the pace of development of the new breed of race planes, supersonic prop speeds may indeed become an issue, but, as far as we know, this hasn't happened yet.

TA

(Continued on page 10)

AIRWAVES

A STEP DOWN

On page 116 of the June issue, you ask "Did the Kline-Fogelman airfoil pan out?" in response to reader Witherspoon's inquiry about using that much touted wing design.

No, as it turns out. The best report I've seen on the Kline-Fogelman wing was prepared by J.D. DeLaurier and J.M. Harris in their article "An Experimental Investigation of the Aerodynamic Characteristics of Stepped-Wedge Airfoils at Low Speeds," published in 1974. Based on both wind-tunnel tests and flights of Kline-Fogelman models (including models supplied directly by Kline), they show that at low Reynolds numbers, "by the criteria of lift/drag ratio, power factor and maximum lift coefficient, the stepped-wedge airfoils are no better than the thin, flat-plate section, which is itself inferior to the thin, cambered airfoil." For larger, subsonic aircraft they conclude that the Kline-Fogelman wing is "attractive for flight applications where high aerodynamic performance isn't the primary consideration." In other words, it delivers mediocre to poor performance.

Kline's book, "The Ultimate Paper Airplane" (1985), reflects the excitement that this airfoil generated, but not the rigorous testing. My own experiments some years ago led me to the same conclusion; Mr. Witherspoon will find that for practical applications, other airfoils can be readily found that will perform better than the Kline-Fogelman wing.

JEF RASKIN
Pacifica, CA

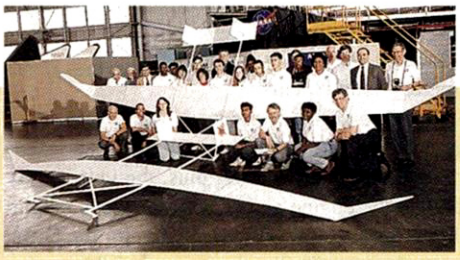
Jef, thank you for answering our question regarding the status of the stepped airfoil. It's interesting to learn that this odd design (with a step cut out of the aft portion of the underside of the airfoil) didn't work out as well as many had hoped—and I think it's worth noting here, given the several inquiries we've received on stepped wings. Mr. Witherspoon would do well to note that he has better choices for his full-scale flying wing—and his models!

TA

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!



RECORD-BREAKING PAPER

Students from Hampton, VA, high schools display the paper airplanes that broke the record in the *Guinness Book of Records* for the largest paper airplane. The plane in the foreground has a 24-foot, 3½-inch span, while the largest plane's span measures 30 feet, 6 inches. These huge creations are made entirely of paper and adhesives; the struts are of rolled paper. Pictured with the students are their advisors from the American Institute of Aeronautics and Astronautics (AIAA), Hampton Roads Section, and officials from the Virginia Air and Space Center. Advisors include world-renowned researcher and NASA retirees Bill Reed, Hewitt Phillips (far right), Richard Whitcomb (second from left) and Jim Penland.

The March 25 event took place in a hangar, where students broke the record twice before setting the final milestone with a handmade craft weighing less than 8 pounds. The record they broke had been set by a paper plane with a 16.4-foot span that glided 85 feet, 6-inches. The new worlds record, set flying the 30-foot, 6-inch plane, is now 114 feet, 9 inches.

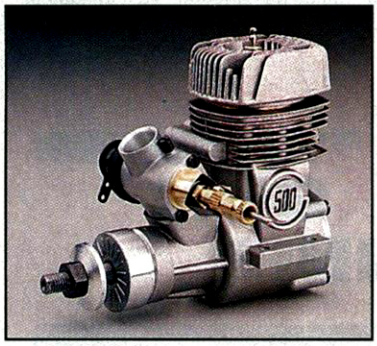
TOP GUN WINNER

Congratulations to Charles Nelson of Berlin, MA, for winning the 1992 Top Gun Invitational held May 7 to 10 in Palm Beach, FL! Nelson took 1st place in the Expert Division with his 1/5-scale VKS7F Waco. The 16-pound, O.S. .91-powered plane was designed from a Paul Matt three-view and is made of balsa, lite-ply and fiberglass. Dean DiGiorgio and Bob Pickney won 1st place in the Team Scale Division with their C-45 Beech Twin. See our next issue for a full-color story on this world-class scale competition sponsored by *Model Airplane News* and Pacer Technology.

This is a 0.025ci 5-cylinder radial designed by Jef Raskin of Pacifica, CA. This little gem, which has an outside diameter of only 2 inches, has flown on two models so far: a free-flight and an R/C miniature. It used plastic props designed for rubber models. If you want to know more, contact Jef Raskin, 8 Gypsy Hill Rd., Pacifica, CA 94044.

CO_2 Radial

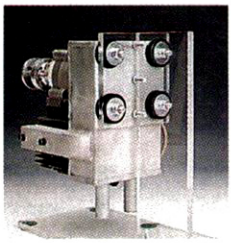
AIR SCOOP

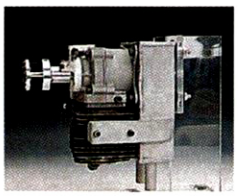


Affordable Quickie

The new Super Tigre G-500 was designed to help re-establish the popularity of Quickie 500 racing by supplying the racer with a more affordable engine. The totally new G-500 was specifically created for racing and is not a revamp of an existing sport engine. Great Planes Model Distributors claims the G-500 has "all the performance features of top-level competition, without the high cost." Retail is $249.95.

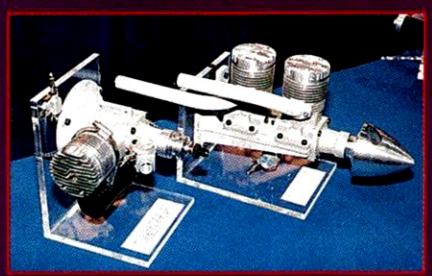
ZENOAH G-92?!



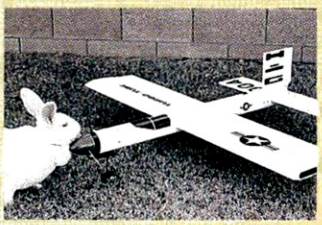


R/C America of Champaign, IL, may have solved many problems facing the G-62 owner with their new Muffle-Mount. How does 92dBs at 3 meters sound? This combination muffler and motor mount is just a bit deeper than the usual cup-type mount used on the G-62, so installation doesn't require a cowl change; plus, the unit is only 3/8 inch wider than the engine and exactly the same height. The Muffle-Mount is presently only available for the G-62, but others are on the way. By the time you read this, a version should be ready for the Sachs 4.2. For more info, contact R/C America 405 Hilltop Rd., Champaign, IL 61821; (217) 359-5116.

SMOKIN' MOKI



At the latest R/C Unlimited race in Marana, AZ, the Moki 3.6 twin did it again. Bill Hempel, flying his own design Stiletto (soon to be kitted by Hobby Barn, rumor has it), took the gold. Bill's plane was propped with an 18x14 Zinger pulling the Stiletto to 143mph in the 96-degree temperatures. Bill was also the top qualifier, and the second-place qualifier, also a Stiletto, was again powered by a Moki 3.6. twin. For more information on the race-winning Moki line of engines, contact Davis Diesel Development Inc., Box 141, Milford, CT 06460; (203) 877-1670.



HIGH-SPEED HARE-PLANE

Hi-G has developed this interesting ready-to-fly model—the Turbo-Tube. It requires no glue for assembly. Just screw the interlocking modular sub-assemblies (engine pod, tail group, landing gear, plug-in wings) together with 13 screws in 10 minutes. The T-Tube has all surfaces hinged, and it comes with a Hayes KM-40 engine mount, an 8-ounce tank and Sullivan linkages installed. Also included are Sullivan Skylite wheels and a 3-inch Goldberg spinner. Because of its design, the Turbo-Tube is capable of more than 100mph in level flight with a stock .46 2-stroke, and it's recommended for the moderately experienced sport flier. Calmer performance can be had with a .35 2-stroke. So if you want to hop into the air with a plane that's described as flying, "straight as a bullet and capable of gut-wrenching, maximum-G maneuvers," contact: Hi-G, 2131 E. Crocus Dr., Phoenix, AZ 85022; (602) 788-5209.

PHOTO BY NANCY WEIDHAAS

SINGLE-SERVO Multiwiz

Right, left, up, down and trim to boot

by ROY CLOUGH JR.

YUP, THAT'S RIGHT—just one servo and two channels. Count 'em—two; separate and independent. And you can trim "rudder neutral" from the ground. How about that? Is it complex or difficult to handle? Not at all. With a Futaba R102JE 2-channel receiver and S133 microservo powered by a light, 4-cell, 110mA Ni-Cd battery, the Multiwiz is a lively, precise instrument. You can steer it right or left, and you can trim rudder without engaging the elevator, so you always have up-elevator to perform loops, snap rolls and dives or to round nice flares into your landings.*

The notion to use one servo for two-channel control popped up while I was corresponding with Dick Henderson about the possibilities of small, lightweight radios. After mulling over his remarks, I had a flash of insight: spring-loaded control surfaces that automatically return to neutral could be nudged by machinery that wasn't directly connected to them. The same machinery could then move on to nudge something else. Bingo!

In the Multiwiz, therefore, a pair of cam lobes is deflected by a servo-arm roller to activate the rudder. Just outside the arms' range of motion, the roller contacts a yoke that's attached to the elevator. All this is controlled using the transmitter's rudder stick. You still get proportional rudder when you move it right or left, but full rudder happens at about half the full travel. Just beyond this point, you hit a null point and the rudder returns to neutral. If you move beyond this point, the elevator is engaged. If the stick is moved to its extreme right, the elevator will be raised; if moved to its extreme left, the elevator will be depressed.

The neat part is that you don't have to apply rudder to get to the elevator. When you move the stick quickly to up- or down-elevator, the rudder only jiggles.

You can, incidentally, still use the trimmer on the transmitter to zero in the rudder during flight. The effect on elevator control will be minimal. The control moves are easy to learn, and their use becomes intuitive after a couple of flights. The stick position isn't very sensitive. Originally, I thought about "desensitizing" the joystick by lengthening it with stiff plastic tubing to increase its travel, but the system proved so easy to master that this wasn't necessary. Nobody yanks full right or left anyway. Normal rudder moves stop well short of the Multiwiz elevator function.

The Multiwiz II offers aileron and rudder control using a single servo. The technique may hold promise for ultra-miniature R/C aircraft.

During the early tests, the Multiwiz flew well, if somewhat gently, with a Cox* .02 PeeWee. Its control response was so good that I decided I wanted more pizzazz and installed an .049 Golden

Bee. The Multiwiz was still easy to handle, but its performance envelope was expanded dramatically.

MULTIWIZ ANTECEDENTS

Before we start building, I'd like to give you the background of the Multiwiz airframe design. In 1935, I had just started building stick models and Guillow kits. That year, the Wakefield Trophy was won by a proxy-flown model designed and built by a chap named Gordon Light. His big Wakefield, with its realistic cabin (with windows), stirred my daydreams. My attempts to copy its outlines resulted in my first home-brew designs that flew really well. These gradually evolved into the simplified flat-bottomed fuselage and high cabin lines of my Multiwiz series. Since then, I've built maybe a dozen rubber-, gas- and electric-powered models, all of which stem from the inspiration I got from Light's Wakefield winner. (I'm happy to report that Light is alive, well, active in modeling and living in Maine.)

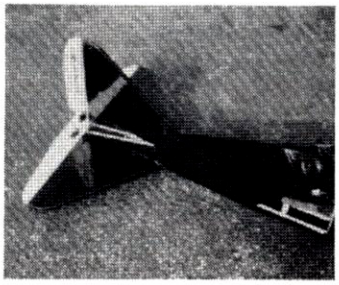
I chose the Multiwiz configuration for my "two-channels-from-one-servo" model because it's a stable flier, and it has the interesting characteristic of requiring very little rudder deflection to turn in either direction. This means that there's plenty of servo motion left over after actuating the rudder.

AIRFRAME CONSTRUCTION

The model is made of balsa sticks and balsa sheet and is covered with lightweight iron-on film. I like iron-on covering for "experimentals," because it saves the trouble of building access hatches. Cover over everything and, if access is ever required, simply chop it open, make your repairs and iron on a patch.

No special instructions should be needed by anyone who has glued two sticks together, but a few hints may speed up the process.

Because of its triangular aft section, you don't build the fuselage in the usual one-side-over-the-other fashion. Make up the $^1/_8$x$^3/_8$-inch bottom longerons as the basic



Rudder and elevator control rods are visible.

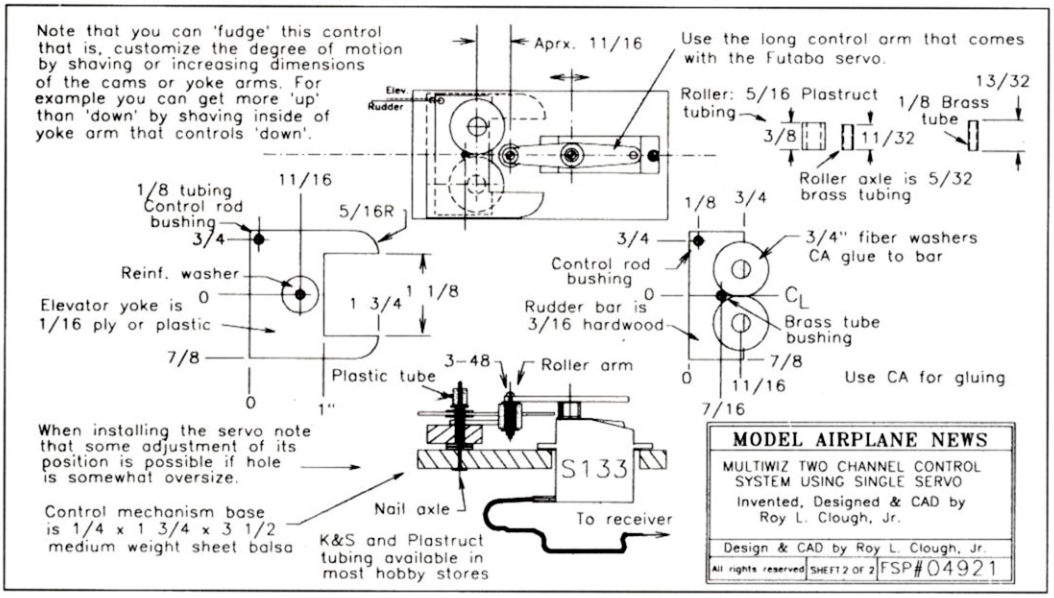
crutch. (Notice the two-piece spreader at the landing-gear location.) At this point, install only the front (vertical edge) piece. You'll install the adjoining crosspiece after the landing gear has been installed.

Stick on and square up the $^3/_{32}$-inch firewall. After the CA has set, this will serve as a buttress against which you can brace the assembly of the nose struts, diagonals and cabin uprights. The two front uprights are grooved to hold the .078-inch-diameter wire landing gear, which will be glued into place with CA after the fuselage structure has been completed but before the bottom cover has been attached.

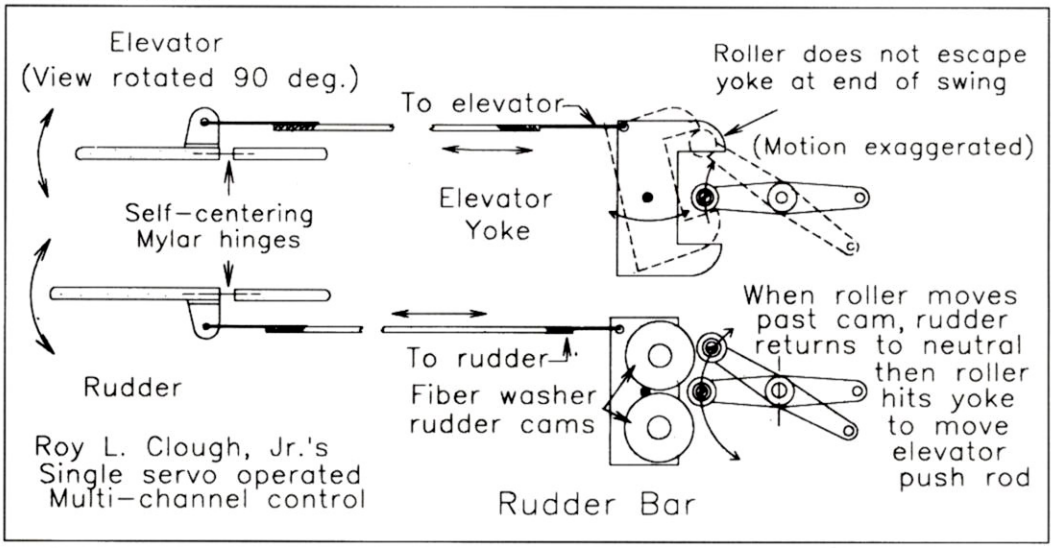
The easiest way to assemble this sort of "unsupported" structure is to put a drop of CA on the end of the upright and hold the upright on the bottom longeron—against the edge of a square—until the glue "catches." After the spine longeron and its sheet-balsa cabin-end attachment have been installed, it's easy to "eyeball" the assembly and correct minor alignment discrepancies.

Build the horizontal stabilizer flush with the bottom of the fuselage. Don't omit the $^1/_{16}$-inch-thick sheet-covering guides. Install the

2-CHANNEL CONTROL DETAIL



HOW IT WORKS



wing dowels, and then install the engine temporarily. Back up the firewall with a piece of very soft 1/8-inch-thick balsa to anchor Du-Bro* self-embedding flanged nuts, which are held with a tiny drop of CA after they've been pulled into the wood with the engine-mounting screws.

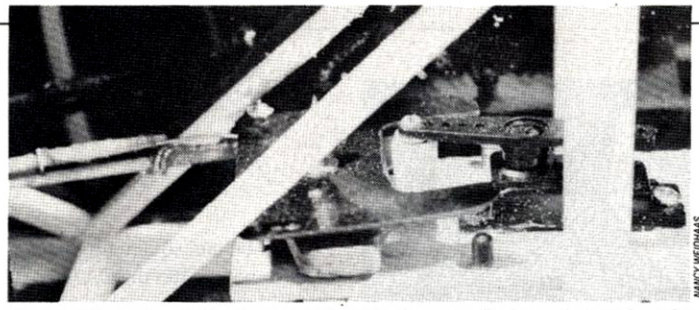
Remove the engine, make up the landing-gear wire and use CA to glue the wire in the cabin upright grooves. Put in the flat half of the front spreader (mentioned earlier), and cover the indicated sections with 1/32-inch balsa sheet. Cover the fuselage with iron-on covering except for the right side, aft of the 1/32-inch sheet.

On the original, I made the windows of acetate. An alternative is to stick on simulated windows in a contrasting color. Black is good for light backgrounds; silver or light blue look fine on dark backgrounds. These are easier to install and keep clean than acetate.

The wing is classic rib-and-spar construction with a topside leading-edge sheeting of 1/32-inch balsa sheet, which *isn't* notched into the ribs. This setup requires less work than "inletting," and it makes no discernable difference to flight performance.

Put balsa sheet over the center section to support the rubber-band hold-downs. The dihedral is 3 inches under each wing tip. Glue the doublers over the spar dihedral breaks. (No "twist" or washout is used on the wing.) Cover the wing with iron-on film.

I made the elevator and rudder out of a Styrofoam deli tray, but lightweight 3/32-inch-thick balsa would also work. Use CA to glue the Mylar drafting-film hinges into slits in the stabilizer, fin, rudder and elevator. (Any thin, springy plastic will work, but Mylar is more resistant to cracking.).



NANCY WEDHAAS

The top of the yoke mechanism that offers single-servo, 2-channel control can be seen in the fuselage.

SINGLE-SERVO CONTROL MECHANISM

The control mechanism base is made of hard 1/4-inch balsa that's slotted to accept the S133 microservo and fitted with an axle (a threepenny nail). The brass-tube bushed elevator yoke and the rudder-cam crossbar are stacked on this axle.

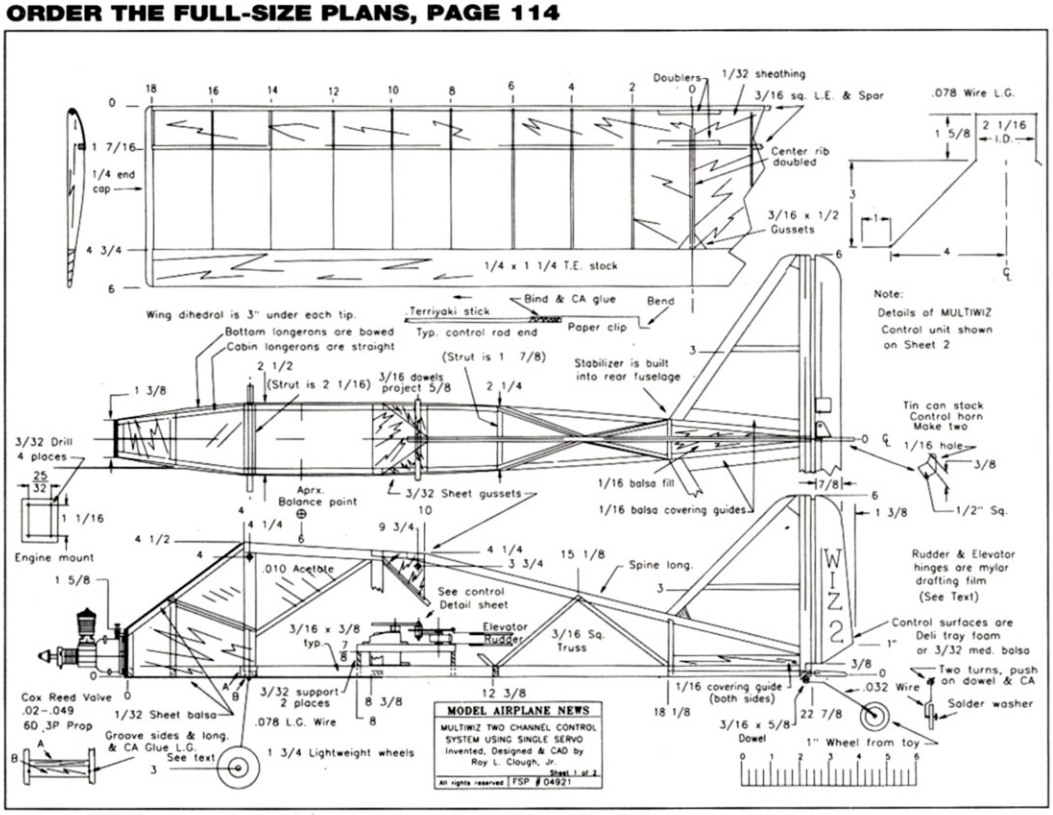
Remove the small four-arm control quadrant from the S133 servo. (You'll replace it with the long two-arm unit.) Note how the roller assembly is attached to the tip of the arm. You'll have to drill a hole (carefully!) for the 3-48 screw that holds the roller assembly. Don't make the roller diameter any larger than shown, because you need the swing clearance to separate the rudder and elevator functions.

The elevator yoke in the original model was made of stiff 1/32-inch-thick sheet plastic, but 1/16-inch-thick hardwood ply would work just as well. A 1/8-inch-diameter brass-tube bearing is pushed through the yoke and sandwiched in place between washers that have been glued together with CA. The rudder-cam crossbar fits with a brass-tube bearing in the same fashion. The cams consist of two 3/4x1/16-inch fiber washers that are glued in place with CA. The use of separate fiber washers as rudder cams allows a little leeway during assembly. Note that the servo-arm roller must push the rudder cam and then ride past it to contact the elevator yoke. When the roller passes, the spring action of the self-centering hinge causes the rudder cam to return to neutral. On the return swing, the roller again bumps the cam as the control is centered.

In an earlier version of this control, I hinged the cams so that they'd swing out of the way on the return stroke, and motion wouldn't be

(Continued on page 42)

ORDER THE FULL-SIZE PLANS, PAGE 114



SPECIFICATIONS

Type: Experimental 1/2A
Wingspan: 38 inches
Length: 28 inches
Weight: 15 ounces
Wing area: 236 square inches
Wing loading: 9.2 ounces per square foot
Power recommended: Cox .049 Babe Bee (no. 350) or a comparable 1/2A engine
No. of channels: 1 (independently actuates aileron and elevator)
Features: this balsa-and-light-ply built-up design includes a yoke mechanism that permits independent, proportional control of two control surfaces using one servo. This setup eliminates the weight of a second servo, and a variety of micro-R/C designs could benefit from it.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1992. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

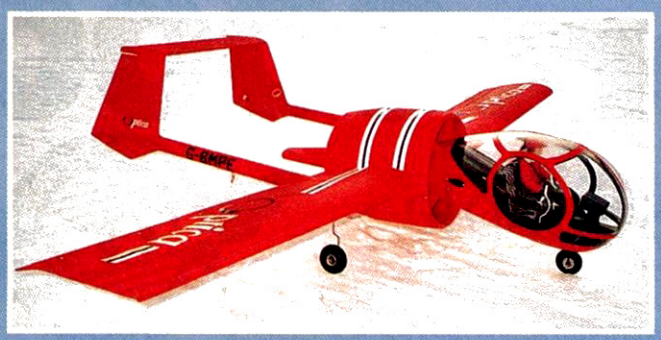
Send those pictures to:
Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

"NOT FOR SALE"

Forty-nine-year-old Blaine L. Stetler of Crystal River, FL, who tells us he has been confined to a wheelchair for much of his life but is now on crutches, has been "modifying, hacking, and designing" model airplanes since childhood. This 3 1/4- to 4 3/4-pound airplane flies on a .25 to .46 engine, and it's the first to fly "like a sport plane should," Blaine reports. He should know; over the last 10 years, he has flown all types of aircraft and has taught more than 50 people to fly trainers. With a wingspan of 52 3/4 inches, the plane is said to handle well—even in winds of more than 20mph. As its name implies, nearly all who see it want it!

"SORT-OF SCALE" ULTRALIGHT

A single, geared Astro Flight 15 cobalt motor powered by two 7-cell 1200mAh packs turns an 11x7 pusher prop on Eric Woods' scratch-built ultralight. Eric, who hails from Sebastopol, CA, used K&S aluminum tube and rip-stop nylon to make the craft, which has a wingspan of 63 inches and a flying weight of 5 pounds. What caught our eye was the linkage that connects the pilot's hands and feet to the rudder, throttle and elevator. "Oscar Alvin Diddlerudder," as he's called, moves his limbs as a real pilot would when flying!



OSLO OPTICA

Per Andresen of Oslo, Norway, says he likes to build scale aircraft "that have a rather odd shape." After losing his first Edgley Optica to bad transmitter batteries on its first hop into the air, this indefatigable Norwegian went back to his well-insulated building cabin and built another of these 1/5-scale patrol craft. Shown here on a frozen lake outside Oslo, the 10.5-pound model has a wingspan of 81 inches and is powered by a Super Tigre .61 ABC in pusher configuration spinning an 11x12 prop.

PILOT PROJECTS

OVERKILL 280

This kit started as a Pica Dualist 240, but Robert McCormick of Leamington, Ontario, Canada, decided he wanted extra horses on board. With two Saito .80 Golden Knights, this plane now has all the power Robert wants. It also has split flaps and Spring Air retracts. Mods include basswood spars, larger wheels (for the extra clearance needed to swing APC 10x10 props) and a reinforced wing saddle. It's no wonder the model has won prizes at local modeling shows!

FIRST SCRATCH-BUILT PROJECT

Ed Semling reports that his first scratch-built project—this Gee Bee Y Senior Sport based on H.A. Haffke plans—was "very stimulating because of the necessity to create solutions and think your way through." The 1/5-scale, 10-pound beauty has a 72-inch wingspan and is powered by an O.S. .91 4-stroke. Covered with super Coverite and finished with custom-blended K&B Super Poxy paint, the plane even includes aluminum litho-plate details. Scale panel lines made of 3/64-inch chart tape and rivets made of R/C 56 glue drops top off this eye-catcher from Long Beach, CA. Good job, Ed!

CITABRIA IN THE CITY

Chuck Hofmann Jr. of Welbourne, FL, finished this Sig Citabria kit with MonoKote, and he painted the pants and the cowl. Power is supplied by a Royal 40 BB that swings a 10x6 Master Airscrew prop. Chuck added flaps, a smoker kit and a panel to access the engine, yet the plane weighs only 5 3/4 pounds. Chuck says it's an eye-catcher on the flying field; we think it looks pretty nice parked in the city, too!

TWO-YEAR LASER

Fifteen-year-old Jared Fowler of Germantown, TN, has been flying since he was 11. His progress must have been impressive, because three years ago, a local club gave him this Godfrey 1/3-scale Laser kit to encourage him to compete in scale competitions (which Jared says he plans to do "soon"). Two years in the building, the plane is powered by a Webra Bully and controlled by a JR Galaxy 8-channel radio. Jared's next project? A Ziroli 1/4 scale P-51. Let us know how you do in scale competition Jared; we're always happy to seen new entrants and would like to see you at Top Gun some day.





Top row, left to right: A 1/4-scale Stretch Ultimate is shown on a horizontal flat pass. The fuselage's red top draws a straight line next to the white fuse sides. This provides a reference line parallel to ground, and thus aids in straight flight. The left cabane (showing) is all white. Right cabane has a red band. "Red=right" helps learning maneuver symmetry, especially in loops. ■ Here the plane is in a horizontal pass with low left wing. The fanning back pattern on the top wings appears as a wide arrowhead to orient the airplane parallel to runway, flying away, or flying inward when slightly rolled as shown. ■ Note that all four wings have a red stripe wing tip, then a yellow stripe, then a blue stripe, and are otherwise white. Notice the yellow wing-tip stripe on left lower wing, and white fuselage area below the red turtle deck. This means the knife edge was not quite rolled enough. ■ Second row, left to right: The plane is on the knife edge but notice the lower wing's yellow stripe showing ahead of the upper wing's red leading edge. The knife-edge path is inward, not parallel to runway—downgrade! ■ The plane has rolled to opposite knife edge. Red circles on the bottom of the aircraft provide instant orientation differentiation from its top in any lighting conditions. The dark blue bottom and the amount of the white fuselage side showing indicate that the airplane is rolled right about 45 degrees. The horizontal angle of the blue bottom indicates plane is probably on an upward and outward vector in relation to the runway.

DON'T COLOR ME GONE!

by DR. ROBERT SUDING


Maximize aircraft visibility to improve your piloting

Left center: the front three planes in this lineup were designed and scratch-built by author and son. Ultimate's tail-edge sequence is red, yellow and blue which is much more visible than Tesla's red, blue and yellow sequence. At a distance, the gray-scale value of the adjacent red and blue merge to a single dark color whereas the Ultimate's colors stay separated by the lighter yellow shade.

The Roach and the Conquest at the end have red rudder tops that are colored quite differently than the banded colors on their horizontal stabilizers. This coloring difference is very helpful in controlling vertical roll-termination points. The Conquest's red top color slopes downward toward the front. A symmetrical airfoil airplane flies with a slightly nose-high attitude. A downward-sloping top line color provides a parallel to-the-ground perspective for symmetrical-airfoil Novice pattern airplanes, which do not fly inverted patterns. The Tesla and Roach have a parallel top color line that's a more suitable compromise for upright, inverted and vertical maneuvers in FAI.

Low landing approach, backlit by low sun. The combination of white fuselage and cabanes along with red wing leading edges parallel to runway edge shows that airplane's landing attitude is satisfactory, but slightly rolled right requiring just a touch of left aileron for a perfect landing.

PHOTOS BY DR. ROBERT SUDING

ALMOST EVERYONE has had that "I can't tell which way it's going" feeling when learning to fly R/C. Several simple color trimming steps can help you fly your airplane better, whether you're a beginner or top dog in FAI.

Most planes are covered or painted to look good in the pits. But in the air, it's a different story. The situation is really simple: if you can't see it, you can't fly it!

In this article I'll analyze what's required for good aircraft visibility, and will make recommendations that will help you maximize the visibility of your R/C aircraft. If you follow these recommendations, you should have more success and fun at the flying field.

To successfully operate an R/C aircraft, the pilot must have good orientation and distance perception. The human eye estimates aircraft orientation based on the perceived position of the model's outer edges, and the relationship of these outer edges to the edges of any discernible trim markings on the plane's wings or fuselage. Distance perception, in turn, depends on a combination of one's perception of the aircraft's outside edges and its estimated orientation.

After you've located your airplane and estimated how far away it is, you must immediately recognize several attitude orientations:

- Is it flying toward me or away from me?
- Is it upright or inverted?
- Are the wings flat, vertical, or tipped?
- Is it flying horizontal, upward, or downward?
- Is it moving parallel to the runway?
- Am I pulling or pushing vertical in FAI?

The following suggestions will help you with distance and attitude perception. Visual acuity and contrast perception diminish with age, but by using correct color concepts, even senior fliers will find that visual orientation of their aircraft can be consistently and reliably achieved.

SOLID-COLORED AIRCRAFT

R/C airplanes are flown in all kinds of weather and background conditions. A solid-colored aircraft will sooner or later fly into a condition where it blends into the background, resulting in a complete loss of location since no edges can be perceived. The absolute worst, in my opinion, is a silver Mustang on an overcast day. Yellow Cubs are tough to see when backlit by the sun. My dark green Sweet Stik would disappear when my landing approach was too low and the sight line dipped below the distant tree line. Red Stiks and dark blue sport pattern planes go invisible in late evening and storm conditions.

WING & HORIZONTAL STAB SHADES

The top of the wing is normally lit by sunlight. The bottom of the wing is shadowed. Coloring the top of the wing and horizontal stabilizer lighter and the bottom darker keeps this same orientation in varying lighting conditions. Almost all ARF trainers have a wing that's identical, top and bottom. I always recommend that beginners cover the bottom of the wing and horizontal stabilizer with dark blue contact paper before flying these planes. Then the beginner can quickly learn that the dark side is the bottom side. The exact dark color is not important.

GEOMETRIC SHAPES

Your brain is able to recognize significantly different shapes more quickly than colors, especially in poor light caused by heavy overcast, evening flying and back lighting. I use large red circles under the wing and horizontal stabilizer and straight lines on the top of the wing and horizontal stabilizer, which results in instant orientation recognition, especially when doing vertical rolls and spins in FAI patterns. The color of these large cir-

Far left: top view of the four airplanes. The Conquest on the right with its widely separated two starburst wedges is by far the most visible pattern at a distance. Close-in maneuvers are done with less orientation data, however. The Conquest's horizontal stabilizer pattern is different from the wing pattern, and this slightly aids orientation recognition in pitching maneuvers such as Lomcevaks. ■ Near left: The bottom view shows several color scheme experiments. The Tesla's red circles are too small, and are more difficult to see when doing vertical rolls at a distance. The different horizontal stabilizer bottom patterns on the Tesla and Conquest help in pitching maneuvers. The Roach's wing and horizontal stabilizer bottom patterns are too similar to the top patterns, resulting in occasional over-rotation on vertical rolls.

TIPS FOR BETTER AIRCRAFT VISIBILITY

Near left: my friend Lee Demary's "Stealth" pattern plane was colored with the idea that "you can't be down-graded if the judges can't see it" philosophy. Lee hasn't won in a long time. Every time I see Lee at the field, he has added another orange mark on the "Stealth." The summer temperature of Lee's radio and battery must be way up there!

- **Avoid single-color aircraft, particularly solid silver or solid dark colors.**
- **Beginners are advised to color the bottoms of aircraft wings a dark color, and the tops a light color.**
- **Orientation recognition can be enhanced by placing large dark circles under the wings and a starburst pattern of straight lines on the top.**
- **Any series of adjacent colors on your aircraft that are intended to facilitate orientation should be gray-scale opposites, not color opposites.**
- **Don't rely on intricate patterns—they tend to blend together to form an edgeless fuzz approximately 100 feet away.**
- **A bright red or orange leading edge on your wing and horizontal stabilizer will help you keep your wings flat during landings.**
- **Color lines parallel to and above the fuselage horizontal thrust line provide a good angular reference on the glide path prior to the final turn.**
- **For better loops, make the wing tips and horizontal stabilizer tips red or orange and the body background a very light color such as white or yellow (this helps you tell whether the wings are flat).**
- **Curved or slanted horizontal color lines on the fuselage can contribute to disorientation on horizontal passes, upsetting entry to loops.**
- **A starburst pattern on the top of the wings and elevator facilitates perception directional orientation at a distance by forming an "arrowhead."**
- **Gray-tinted sunglasses are recommended, orange-tinted glasses discouraged.**
- **An aluminum spinner and a light-colored nose can result in off-center maneuvers due to an ill-defined front edge.**
- **Try out different color schemes and patterns on small-scale balsa gliders to see how well you can see them in the air.**

cles isn't important as long as they're a very highly saturated, darker color against a light background.

PERCEPTION OF ORIENTATION AT A DISTANCE

When flying at a distance of 500 feet or more (depending on the size of the model and lighting conditions), you don't see colors, since the rods of your eyes that do the color perception are 2,000 times less sensitive than the cones, which perceive illumination. Also, at this distance, your perception of depth is no longer based on parallax but on the subconscious training you've experienced since birth which tells you that brighter and bigger is closer, and darker and smaller is farther.

In these circumstances, your gray-scale vision, i.e., your perception of lightness and darkness in a black-and-white image, provides your orientation and depth perception, not color. Any series of adjacent colors on your aircraft that are intended to facilitate orientation should therefore be gray-scale opposites. For example, a series of bands consisting of red, yellow, blue and then white is desirable. Don't assume a series of "color opposites" such as red, green, blue and black will be effective. These all have the same dark gray-scale shade and will show an equal tendency to disappear in a deep blue or heavily overcast sky.

If you use the wrong series of color bands, you won't know how far away your aircraft is, and you won't even know which way it's heading to bring it back. Also, don't rely on intricate patterns. They blend together to form edgeless fuzz approximately 100 feet away. You can test potential color schemes for gray-scale perceptibility by videotaping and playing back the color scheme on a black-and-white TV or on a color TV with the color turned down.

LANDING CONSIDERATIONS

Landing requires keeping your wings flat and knowing where you are in the landing approach. You're generally close to the airplane during the later stages of the landing approach, so your color perception is improved, but the leading edges of the wings should be very prominent against any background such as blue sky, white clouds, overcast, trees, or mountains. Most of these items have spectral lines toward the higher frequency blue or green region, so a very simple procedure would be to have a red or orange leading edge on your wing and horizontal stabilizer.

ARF trainers' blue wing edges are almost invisible at our field when a low approach from the west dips the plane visually below the mountains, resulting in very klutzy landings by beginners. Straight fuselage color lines help to maintain the downward glide path. Color lines parallel to and above the fuselage horizontal thrust line give a much better angular reference on the glide path prior to the final turn.

LOOPING

Looping maneuvers also require keeping your wings flat. When flying parallel to the runway on loop entry, the wing and horizontal stabilizer are edge-on and least visible at the exact time when the orientation is most critical. The airplane is close, so color perception is excellent. If you make the wing tips and horizontal stabilizer tips red or orange and the body background a very light color such as white or yellow, you can easily flatten or slightly tip the wings to achieve perfect loops, Immelmanns, etc. The red or orange tips will stand out against most backgrounds behind the aircraft if the plane is tipped slightly toward you.

"If you make the wing tips and horizontal stabilizer tips red or orange and the body background a very light color such as white or yellow, you can easily flatten or slightly tip the wings to achieve perfect loops, Immelmanns, etc."

The horizontal color scheme of a low-wing pattern airplane's fuselage must provide a line reference, as mentioned above in the landing section, so that the entry to the looping sequence is level. Many pattern airplanes have gently curved or slanted color lines running along the length of the fuselage that misguide the contestant on horizontal passes.

DIRECTIONAL ORIENTATION AT A DISTANCE

The perceived view of a distant airplane flying away at a 45-degree angle can be identical to an airplane flying inward at a 45-degree angle, especially in heavy overcast conditions. If you use a starburst pattern on the top of the wings, top of the elevator and both sides of the rudder, you can instantly perceive direction of movement as an in or out arrowhead, by rolling the wings slightly.

CHOOSING SUNGLASSES

Sunglasses critically impact your ability to see the true colors of your model. Use gray-tinted sunglasses, never orange-tinted glasses. Orange is near the low-frequency end of the visible spectrum and results in much lower edge definition of your model, similar to having your eyes slightly out of focus. Orange-tinted sunglasses also result in a drastic reduction of color perception of distance owing to color flattening, and even gray-scale edge perception is degraded.

FINAL THOUGHTS

A pattern airplane was recently covered with some of the new fluorescent colors that made it stand out like a sore thumb in the pits. It turned invisible at 200 feet from takeoff on its maiden flight and barely made it back to the runway.

Many pattern planes have an aluminum spinner and a light colored nose. The result is an ill-defined front edge that varies according to lighting. The flier will misjudge the distance, start his maneuvers too early or too late, and be downgraded for off-center maneuvers.

Take many pictures of different color schemes and evaluate them for visibility first, beauty second.

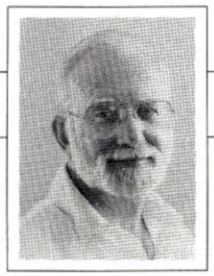
Avoid dark colors on the fuselage section where your battery and radio are installed. The heat buildup from sunlight can result in premature failure. Keep your black transmitter out of the sun, too.

Devise schemes to help with left/right orientation. I put a red stripe on the right cabane of my 1/4-scale Ultimate to help me remember which way to push the rudder for loops and knife-edge flight.

Don't fly when someone with a plane colored identically to yours is already in the air (happens frequently with ARFs). A couple of years ago, two fliers were up with identical airplanes. When one of the models landed, both modelers went out to get the plane. Much to the entertainment of the folks in the pit, one modeler discovered that his plane had crashed out in the field 5 minutes previously because he had lost track of which airplane was his, and he was "flying" the wrong one.

You may be too macho to resort to aids like these. Good. I like to compete against those who make life difficult for themselves. I've attended several pattern contests where the difference between first and second place was one point over two days of flying. Flight-enhancing colors may edge you into the winners' circle.

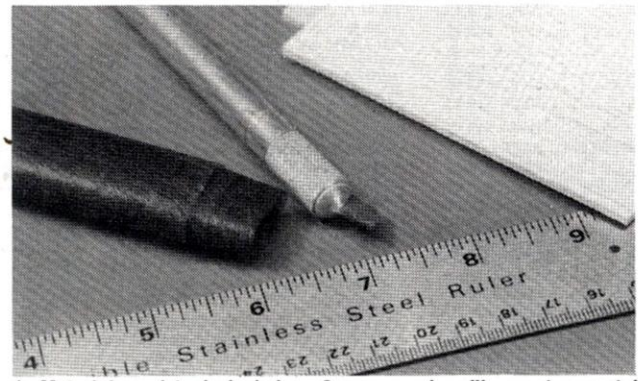
HOW TO:



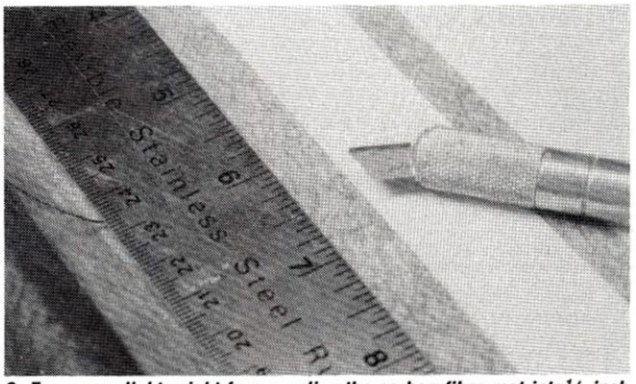
RANDY RANDOLPH

CARBON-FIBER-REINFORCED FORMERS

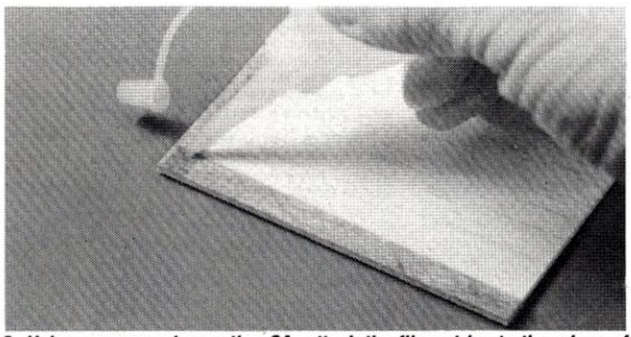
Using carbon-fiber mat to reinforce balsa parts in model construction can increase the strength of those parts enormously. The fact that these parts can then be used to replace plywood in many areas also reduces the weight of the finished product. The photos show the way.



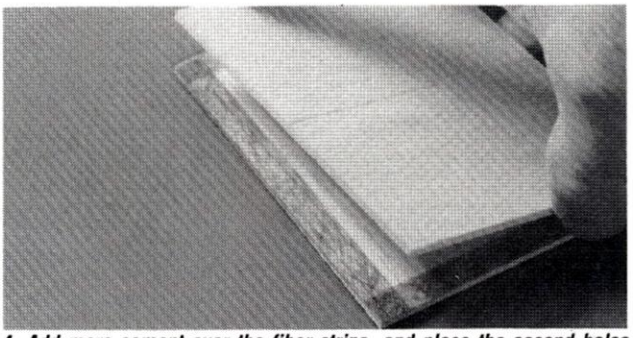
1. Materials and tools include a 2-ounce carbon-fiber mat, a metal straightedge, a razor knife and two balsa sheets (with crossed grain) that are the same size as the former.



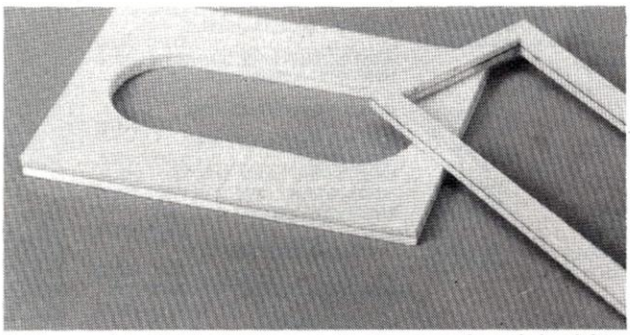
2. For a very lightweight former, slice the carbon-fiber mat into 1/2-inch strips. Hold the straightedge firmly in place so that the mat doesn't shift when it's sliced.



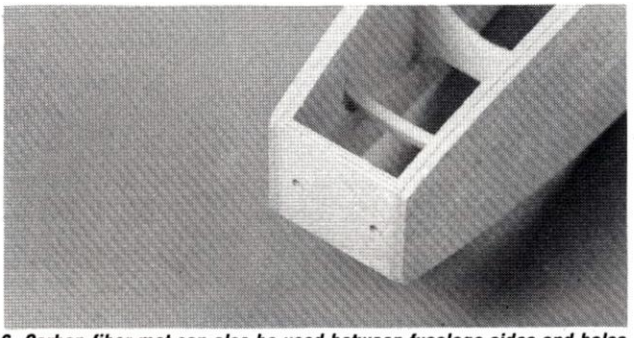
3. Using epoxy or slow-acting CA, attach the fiber strips to the edges of one balsa former. The cement will wick up through the material and form a strong bond.



4. Add more cement over the fiber strips, and place the second balsa former over the first. To reduce weight, cut out the center of the completed former.



5. The completed lightweight formers. The larger one is made by gluing a full-size carbon mat between the balsa ply. A 4-ounce mat and 1/8-inch-sheet balsa should be used for larger formers.



6. Carbon-fiber mat can also be used between fuselage sides and balsa doublers to make very light, strong structures. Information about carbon-fiber products can be obtained from Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714; (714) 250-1107.

GLOW POWER TRIUMPHS AT EVERGREEN

Gold flight line—intense concentration, despite the intense heat.

Above: Dan Egelhoff's no. 96 crosses the finish line 1 second ahead of John Delk's no. 36 in the silver trophy race.

The Second R/C UNLIMITED RACES

by ROB WOOD

THE CURTAIN opened on the second act of the Giant-Scale Unlimited* saga during the last week in April. Twenty-three aircraft from around the country and Canada traveled to Tucson, AZ, to battle the odds for the gold, removing all doubt that Unlimited racing is here to stay.

Dave Johnson and the folks at Hobby Barn investigated five sites before settling on the Evergreen air facility northwest of Tucson, and they couldn't have picked a more perfect site. Aside from unlimited visibility and a beautiful runway capable of landing jumbo jets, the Evergreen facility is the home of

Left: checkered flag at the ready, Jeff Nickerson waits for another winner to blaze across the finish line.

Right: Silver flight line, trophy race. "They came to race!"

PHOTOS BY ROB WOOD

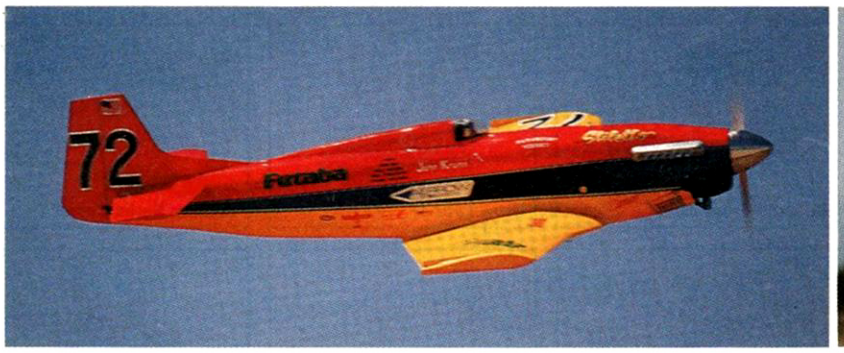
Above: number 64, Scott Manning's scratch-built Stiletto, was favored to win the gold. Bob Holman plans; Robart retracts; Sachs 5.8 highly modified by James George of Monster Motors; 19x16 APC prop; Futaba 5UAP PCM radio; all balsa; Ultracote covering. Above right: old meets new. Evergreen's TBM-3E Avenger lifts off during a demonstration flight. "The best of the last wartime torpedo bombers."

Unknown handler wheels official pace plane past Evergreen's crash truck. Jim Meister fun-scale P-51.

Above: Jeff Nickerson's Giant Hots pace plane shows off for the crowd. Scratch-built from Dan Santich plans (from Model Airplane News); 23 pounds; Zenoa G-62; JR Max 6-channel radio; B7B smoke system; Zinger 22x10 prop.

Below: John Krohn's Stiletto (no. 72) flashes across the finish line to take the silver trophy. Bud Nosen kit; Sachs-Dolmar 5.8; 20x16 Zinger prop; Robart retracts; Futaba FP-T7UAP radio.

Below right: Bob McClung's P-40 Silverhawk was a knockout in its Presto self-stick chrome finish. Wingspan: 102 inches; Sachs-Dolmar 5.8; 22x12-14 prop; Robart retracts; D&W Aircraft kit. Aircraft was later lost owing to technical problems.



the Heritage Flying Museum. The presence of these venerable past warbirds (which include a B-17, a P-40N, a P-51D, a FG-1D Corsair, a Mark XVI Spitfire, a P-38 Lightning, a TBM Avenger and an AT-6/SNJ Texan, to name but a few) added the perfect atmosphere for an event of this kind.

The people at Evergreen also provided Bill Muszala, who flew several of these aircraft throughout the week, to the delight of the spectators and the participants. A lucky few (including yours truly) even got to ride in them. Evergreen also provided crash trucks, emergency medical personnel, security, and a hangar for technical inspections and meetings, and they moved approximately one dozen airliners out of the way to provide space. Throughout the week,

UNLIMITED RACES

Evergreen's TBM-3E Avenger. Bill Muszala, VP of operations at Evergreen, flew this aircraft and several other WW II birds throughout the races. Built by General Motors in 1944, this is the type of aircraft George Bush flew during the war.

Evergreen personnel went out of their way to make this event a success. As a matter of fact, Evergreen is encouraging Dave Johnson to come back for a repeat performance.

Even though the number of entries was down from Madera*, paid attendance was much better at this event; and the excitement level was just as high.

THE MODELS

After Billy Hemple won the Madera Unlimited with his twin Moki A-26, many people thought that the next Unlimiteds would see a large number of glow-powered A-26 airplanes. No one, least of all the promoters of the Tucson races, wanted to see that happen, and as a result, to even the playing field, they increased the minimum wingspan for an A-26 to 122 inches.

They're big, but not that big. Paul Black (third from left) and crew appear dwarfed by no. 151. Retract problems plagued him throughout the week. Scratch-built from Ziroli plans; Sachs 5.8 swinging a 24x12 prop; balsa-and-ply fuse and wings.

The Hemples and Jerry Kikkert decided to build a 122-inch A-26, but they didn't have it completed in time for Tucson. With the exception of one Corsair, all of the competing aircraft in this race were P-51 Mustangs. John Krohn's Aerrow A200S-powered Sea Fury, which performed so superbly at Madera, was thought to be the plane to beat. Unfortunately, it was destroyed in practice prior to the races.

Most of the Gold entries were Stilettos, with stock Mustangs making up the rest. The newest fiberglass racer on the market, which was flown at Tucson (and won the gold), is also one of the most impressive. Produced by Hobby Barn from a Dave Johnson mold, the epoxy/glass fuselage and balsa-skinned wings were light and strong (all-up weight was 26 pounds). This kit will be available soon.

Sky Aviation, Ralph Saxton, Bud Nosen, and Royal accounted for most of the other kits, with several scratch-built from Ziroli and Bob Holman Plans.

IN THE WINNERS' CIRCLE AGAIN!

Far right: silver trophy winner John Krohn with another excellent airplane (no. 72)—Bud Nosen Stiletto. It has an 82-inch built-up wing and a balsa-and-ply fuselage. Weight: 30 pounds; engine: Sachs-Dolmar 5.8ci; Robart retracts; Zinger 20x16 prop; Futaba 7UAP radio; MonoKote covering.

Billy Hemple and the Hobby Barn racing team are leading the pack in more ways than one. Combining a lightweight airframe with a light, but powerful glow engine has won the gold for them twice—first at Madera with their 1.8 Moki-powered A-26, and now at Tucson with a 26-pound Stiletto running a twin in-line 3.6 Moki. Hobby Barn aircraft are marvels of simplicity. Glow engines have no spark plugs and no ignition and produce no RF interference. Vibration is minimal, the structural require-ments are much less than with chainsaw engines, and therefore less stress is put on the airplane. Look for continuing surprises from this innovative team.

In the Winner's Circle—again! Billy Hemple and the Hobby Barn team with their gold-trophy-winning Stiletto (no. 26), 85-inch-wingspan. Epoxy/glass fuselage from a Dave Johnson mold. Balsa-sheeted, foam-core wings; 3.6 Moki in-line twin glow engine; Powermaster fuel; Spring Air retracts; 20x14 prop cut down to 18 inches; Futaba 1024 PCM radio; MonoKote; K&B paint. Soon to be offered as a kit by Hobby Barn.

Gary Porter's bronze trophy Stiletto (no. 85)—scratch-built from Ziroli plans—flew as fast as the silver-trophy winner. Wingspan: 86 inches; weight: 25 pounds; engine: Super Tigre 60cc twin; Robart retracts; Zinger 22x12 prop; Ultracote covering; Airtronics radio.

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THE RADIOS

RADIOS at Tucson were almost evenly divided between Airtronics and Futaba. As at Madera, Airtronics was there to staff the impound, to ensure that their radios functioned properly and to sponsor the races. Most of the radio problems evident at Madera were missing in Tucson, with the major problem being mechanical failure of radio installations owing to heat and vibration. Ignition-caused interference, so prevalent at Madera, was reduced considerably by proper installation and reliable ignition products from Reichmuth, C&H, Tran-Sil and R/C Ignition.

Ultimate Radio—John Delk's (no. 36) FP-T7UAP Futaba PC 1024. Tony Stillman at Radio South custom-built this single-stick radio for racing. SR battery packs in the transmitter; two 1200mAh redundant receiver batteries with Jomar battery back-up switch.

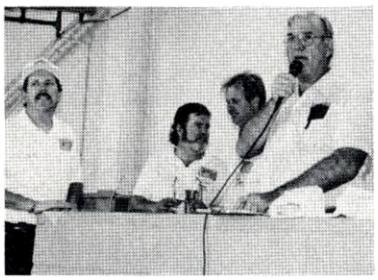
Twenty-four pilots arrived in Tucson with one thing on their minds—to fly the fastest plane around a 4½-mile course. After battling the clock, balky engines, vibration and the searing desert heat, 17 survived to go on to the heat trials. Most of them were Madera veterans and knew what to expect in the days to come, but no one was really prepared for 110-degree temperatures. Exhaust-system heat and ambient temperatures produced oven-like conditions intense enough to melt servo-mounting grommets. The heat took its toll on planes, pilots and spectators alike. Nevertheless, the crowd was treaed to some spectacular flying, most notably by Billy Hemple, who flew racer no. 1, and Kent McKenna, who flew racer no. 45.

Bob McClung's 100-inch Hellcat took on all comers in a "grudge match" after the final Gold race on Sunday. D&W kit; 41 pounds; Sachs 5.2; Airtronics Spectra 7; chambered exhaust system wraps around motor; fiberglass fuselage; foam wings; acrylic enamel finish.

It had been nip and tuck for the two competitors throughout the week. The smart money was on McKenna because Hemple had been having trouble with his Moki 3.6 in-line twin. After several flameouts, Hemple worried that he wouldn't make it into the Gold race, so he spent most of

SAFETY

In a letter to "Airwaves" (June, 1992), Arnt Karlsen expressed concern about safety in the R/C unlimited races. Some of his suggestions, such as onboard warning signals and fail-safe systems, make sense and have been incorporated in many of the giant-scale racers; however, the availability of "bulletproof" mechanisms that would provide the degree of security Mr. Karlsen wants to see is sorely lacking. In fact, as more elements are added to the payloads of these aircraft, their overall complexity makes them increasingly difficult to fly and maintain.



Four of the hardest (and hardiest) workers at the Tucson Races. From left to right: Cal Orr (frequency control), Bobby Wilson (race coordinator and PR), Dave Johnson (promoter and target) and John Elliot (contest director).

The promoters of the Tucson races chose to put a high degree of emphasis on technical excellence and flight-line control. The deadline distance between the flight line and the spectators was increased to 400 feet, while the distance from the pilot boxes to the course was increased to 200 feet. In addition, two fire trucks, a crash truck, and 22 emergency medical technicians were on alert throughout each day of flying. Owing to their efforts, there were no injuries at these races, and no aircraft crashed anywhere near the pilots or the spectators.

As technology improves and experience is gained, giant-scale unlimited racing may very well become the safest of all R/C flying.

THE FUTURE

Giant-scale unlimited racing is in its infancy, and I wish I could say that its future wasn't in doubt. Both the Madera and Tucson races lost money, and unless a way is found for these events to pay for themselves, there may not be many more. Cliff Adams and Tom Easterday wanted to raise R/C miniature aircraft racing to a professional level, and they pulled out all the stops for the first event in Madera. They offered sizable purses, but does it make sense for the organizers to pay out prize money from their own pockets? That's what has been happening.

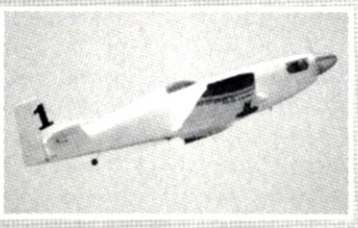
Contestants have also taken adversarial positions. Some have complained that the rules aren't flexible enough, and others have said that they are too vague. Rules should be clear, but until more experience has been gained with these races, it's my opinion that everyone involved should be willing to bend. Is it appropriate for organizers of the races to enter their own races? Should cash prizes be a major factor? It may be worth noting that the "real" Reno Gold purse barely pays for a prop for one of the competing aircraft.

Kent McKenna's Wild Thing (no. 45) performed superbly throughout the races and gave Hemple a run for his money. Second-place Silver Stiletto from K.T. Aviation. Weighs 31 pounds; 5.8 A&M; epoxy/glass and Kevlar fuselage; foam, balsa and carbon-fiber wings; Robart retracts; 20x16 Zinger prop; Ultracote and urethane finish.

Saturday night in the Hobby Barn workshop rebuilding his engine. On Sunday, it seemed to run better, but Hemple still couldn't beat Scott Manning in their last heat race. McKenna seemed a sure-fire bet to win the Gold.

Finally, the ultimate moment in the Unlimit-ed Races arrived. Sam Wright's mellifluous voice announced, "Gentleman, start your engines." Hemple's engine started immediately, and racer no. 1 was the first to take to the air, followed closely by Rodger Grotheer's no. 13. Dan Santich got the engine in his racer no. 9 started, but he lost the steering and couldn't take off. Scott Manning, one of the favorites in this event, couldn't get the engine in his racer no. 64 to fire and, even with the help of another team's electric starter, he failed to start. The 3-minute window expired, and the field was closed.

The three remaining airplanes formed up behind the pace plane. The flag went up, the pace plane pulled away sharply, and all three racers dove for the no. 3 pylon. Hemple was first across the starting line with no. 45 right on his tail. Banking around the first pylon, Hemple edged away from McKenna, and Grotheer quickly lost ground. At the end of the third lap, flying superbly only 6 feet from the ground, Hemple was an eighth of a lap in front of McKenna and pulling away steadily. He widened the gap and crossed the finish line a quarter of a lap ahead.



Billy Hemple's no. 1 climbs out to take 1st in Gold. After nagging engine problems almost put him out of the running, victory never tasted sweeter.

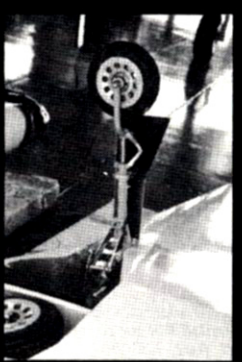
The racing, however, wasn't over. Bob McClung, owner of racers no. 4, 11 and 94, couldn't get enough. He challenged the other pilots to a grudge match that would pit his 100-inch D&W Hellcat against any takers. Dick Sizer (with no. 44) and Santich took the challenge and put up $50 each. When Sizer handed Wright three $20s, he exclaimed, "Hang on to the change; I'll be getting it all back anyway." ***Model Airplane News*** tossed $50 into the pot—just to make it more interesting—and the three planes took to the air. To sum it all up: Dick Sizer crashed, the Hellcat flew like a dog, Santich won the race, and everybody had a ball.

GO *FAST* AND TURN *LEFT!*

THE LANDING GEAR

Miss America (no. 36) after its landing gear had collapsed. Damage repaired, the 38.5-pound airplane lived on to take 3rd place in Silver. Quadra 100SS, 9.5ci engine; 22x16 inch prop; Impact Engineering retracts; Bud Nosen kit; all balsa.

"In order to finish first, you first have to finish." I don't know who said that first, but it's certainly true—especially when it comes to landing gear. All the manufacturers learned lessons at Madera and had improved their products. Robart's new, lightweight, 1/4-scale retracts—with their wide-mounting base and strong welds—are a step in the right direction. Scale Wheels, Century Jet and Spring Air gear all performed adequately at Tucson. Some people complained about the quality of their gear, but no landing gear could have withstood the abuse that some of the pilots at Tucson subjected them to. This abuse included using 110psi with no restrictors in the lines (which could cause the gear to slam down and up, wearing away the block structure) or slamming the plane down on the runway at high speed (which could destroy any type of retract). Pilots who "greased" their landings, however, had very few gear problems.



Larry Sutherland's P-51D (no. 90) with Robart's new 1/4-scale retracts and Scale Wheels tire and hub; 25 percent beefier than last year's model, Robarts performed very well at Tucson. Number 90 took 4th place in Silver.

The best formula for landing-gear dependability is a light airframe plus light wheels plus smooth landings. The first two ingredients can be purchased at the hobby store, but *you* have to provide the last one yourself.

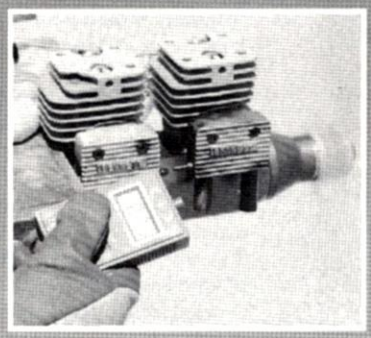
UNLIMITED RACES

Alan Stanford of Sky Aviation echoed the words of many other race fanatics: "There's no substitute for horsepower," and judging from the engines in evidence at Tucson, he's right. Light airframes and powerful engines produce competitive aircraft. Most of the engines at Tucson were Sachs 5.8s. Although the monster chainsaw engines had the most horsepower, they didn't fare well at these races. Last year at Madera, the winning aircraft in each class had twin powerplants. At Tucson, two of the winning aircraft had twin powerplants, and both were glow-powered.

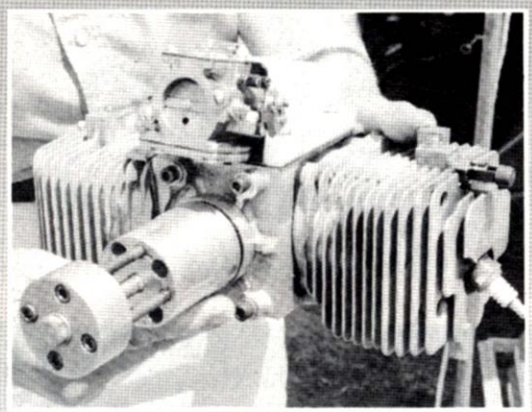
Racing-engine development for giant scale is still in its infancy. The large chainsaw engines are designed to cut trees, not air. Vibration is still a major problem with the larger engines. Lightweight airframes and heavy, vibrating powerplants don't make dependable racers, and until the manufacturers smooth out the bugs, the probability of a large, single-cylinder engine winning the Unlimiteds is slim.

The engines to watch are the Precision Eagle 8.4 in-line twins from Planes Plus Inc., which use Sachs pistons and cylinders, and the A200S opposed twin-cylinder engine from Aerrow Inc.

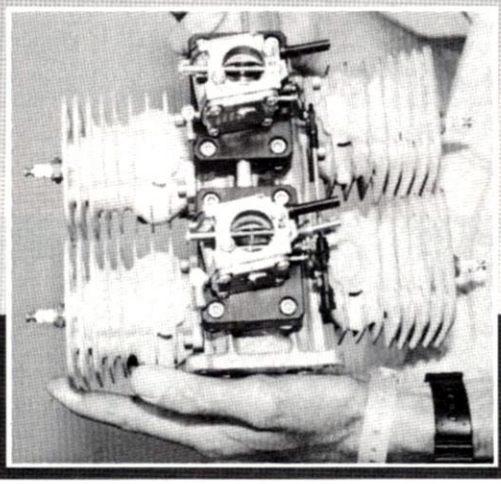
The high demand for precision and



New engine by Planes Plus, Inc—Precision Double Eagle. Two Sachs-Dolmar 4.2 cylinders coupled in-line with separate Tillitson injection carbs. Weight: 10 pounds; available in gas or glow. Look for these engines at Madera in September. Price: $2,500 to $3,500.



Klaus Nowak shows off Aerrow Inc.'s A200S gas-powered opposed twin. Rated at 17hp with five transfer ports; displacement: 196cc; 11.9ci; 11.7 pounds; swings 24x20 prop at 7,000rpm (static). Price: $1,295.



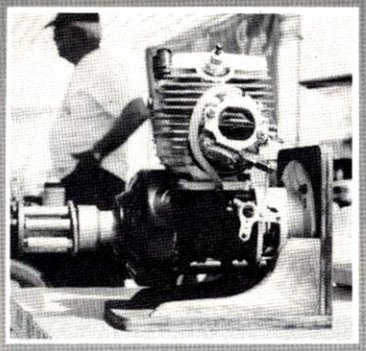
Dave Johnson's 13-pound 3-W Model Motoren 4-stroke engine. German powerplant sports dual carbs and reed valves. Front cylinders fire as a pair, as do the rear cylinders, in alternating sequence. Swings a 28x26 prop at 5,800rpm (static) with carbon-fiber tuned pipes. Look for this engine in Dave Johnson's Bearcat at Madera in September.

Giant-scale unlimited racing is arguably the most exciting competitive event in the world of R/C. Fast airplanes, roaring engines, the thrill of victory and the agony of defeat make for good drama. The technological improvements we've seen in even the last few months suggest that these races are the proving ground for safe, dependable products and aeronautical design. Only a crystal ball could tell you what the future will bring, but if the pilots have any say in it, giant-scale racing is here to stay. As of this writing, the next Tucson races are tentatively slated for November of this year. A second unlimited racing group, (The Unlimited) has scheduled an unlimited race and an AT6-SNJ race for the third week in September.

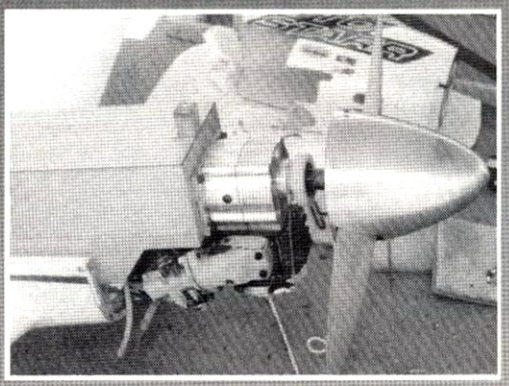
RACING TIPS

- Build a strong, lightweight airframe that weighs less than 15 pounds.
- Find a dependable twin-cylinder engine.
- Install strong retracts with light wheels. Use restrictors in the air lines.
- Experiment with props to find the optimum combination.
- Use strong hinges, and tape all control surfaces.
- Get to know your aircraft *before* you race
- Use your rudder for takeoffs and landings.
- Invest only what you're willing to lose. Racing is a lot like gambling.
- Maintain a sense of humor and good sportsmanship.
- *Go fast and turn left!*

**Here are the addresses that are pertinent to this article:*
***R/C Unlimited Racing Association, Inc.**, P.O. Box 18038, Tucson, AZ. 85731, (602) 722-0607.*
***Madera races;** The Unlimited, P.O. Box X, Torrance, CA 90507, (310) 320-8369.*



John Eaton's Stihl 084 chainsaw conversion. This 7.4ci engine weighs 8 pounds and has ported, polished, dual spark plugs and dual ignition with a muffled header. Swings a 20x20 prop at 9,600rpm on the ground. Retail price: $1,250.

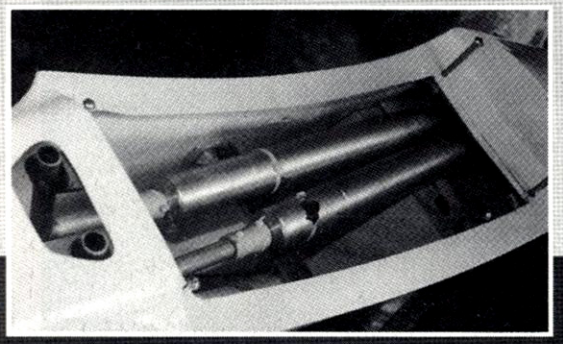


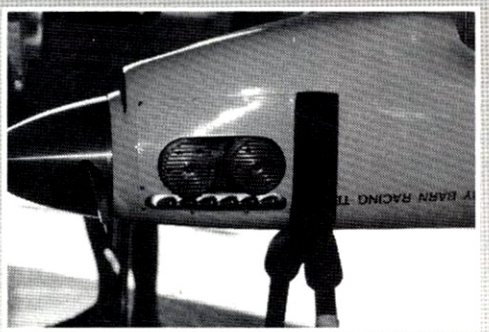
Alcohol-powered Sachs 5.8 conversion by James George of Monster Motors. Dick Sizer (no. 44) flew his 27.5-pound Stiletto at an estimated 170mph during the heat races with this motor.

The most impressive engine at these races was the alcohol-powered Sachs 5.8 that was in Dick Sizer's Stiletto, which he scratch-built and flew. Modified by James George, the engine pulled the 27½-pound airplane through the air at an estimated speed of over 160mph in the heat races. Although mechanical problems prevented him from flying in the silver-trophy race, the performance of this engine suggests that alcohol conversion is a viable alternative to gasoline.

Having the right engine is only part of the solution. Experiments with prop modifications, diameters and pitches were on-going throughout the races. Fred and Otto Burgdorf were in Tucson to introduce their new giant-scale APC props with detachable blades. Billy Hemple ran a 20x14 APC cut down to 18x14, and he proved the effectiveness of these props in his dash for the gold. Zinger and Carvon props were also abundant.

dependability in racing technology will produce better and better miniature aircraft products. People like Klaus Nowak of Aerrow Inc., James George of Monster Motors, Carlos Grageda of Walker Machine, John Eaton, of Aces Saw Shop and Don Kanak of Planes Plus Inc., along with many others are spending long hours and many dollars to perfect these engines, and their efforts will benefit us all.





Left:Gold-winning engine: Hemple's 3.6 Moki in-line twin. This 2-stroke glow-powered engine—imported by Davis Diesel— swings an 18x14 prop. Far left: Twin pipes for the Moki 3.6 boosted rpm by approximately 700. Most internally mounted tuned pipes created problems in the over-100-degree temperatures at Tucson.

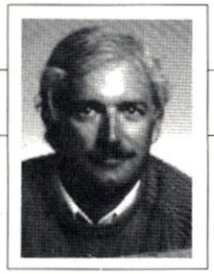
THE ENGINES

SCORING

Position	Pilot	Plane	Engine	Prop	Race	Lap time /Est. mph
Gold						
1	Bill Hemple	P-51	Moki 3.6 inline twin	18x14 APC	1	120.75/134.1615
2	Kent McKenna	P-51	A&M 5.8 (Walker mods)	20x16 Zinger	45	127.13/127.3589
3	Rodger Grotheer	P-51	Sachs-Dolmar 5.2	22x16 APC	13	126.09/110.8905
Silver						
1	John Krohn	P-51	Sachs-Dolmar 5.8	20x16 Zinger	72	150.87/107.3772
2	Dan Egelhoff	P-51	Quadra 100	22x14 Zinger	96	166.44/97.3324
3	John Delk	P-51	Quadra 100SS	22x16 APC	36	167.31/96.8263
4	Larry Southerland	P-51	Sachs 5.8 (Aces mods)	22x16 APC	90	182.31/88.8569*
Bronze						
1	Charlie Beverson	P-51	Super Tigre 60cc twin	22x12 Zinger	85	150.25/107.8203
2	Duke Crow	P-51	Sachs-Dolmar 5.8	22x14 Zinger	70	183.65/88.2113
3	Adam Gelbart	F4U-Corsair	Sachs-Dolmar 5.8	Custom	69	191.65/84.5291

*Flew as alternate to Sherman McCoy who couldn't make the start.
Note: estimated speeds are point-to-point time conversions. Actual speeds were higher.

AEROBATICS MADE EASY



DAVE PATRICK

LANDING IN CROSSWIND

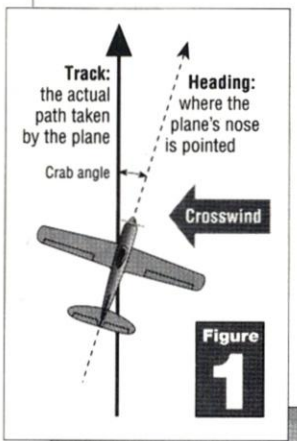
LAST MONTH, I told you how to take off in a crosswind. Now comes the fun part: landing your aircraft in one piece! It isn't that difficult, but you'll have to follow a fairly basic formula. Then you'll have to practice and build up your confidence on the sticks to make it happen. Try to work on your proficiency a little at a time; trust me, you can't cram all this in at once, and there's no Evelyn Wood Speed Flight-Training course available yet!

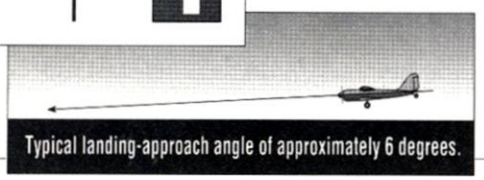
BEFORE WE START

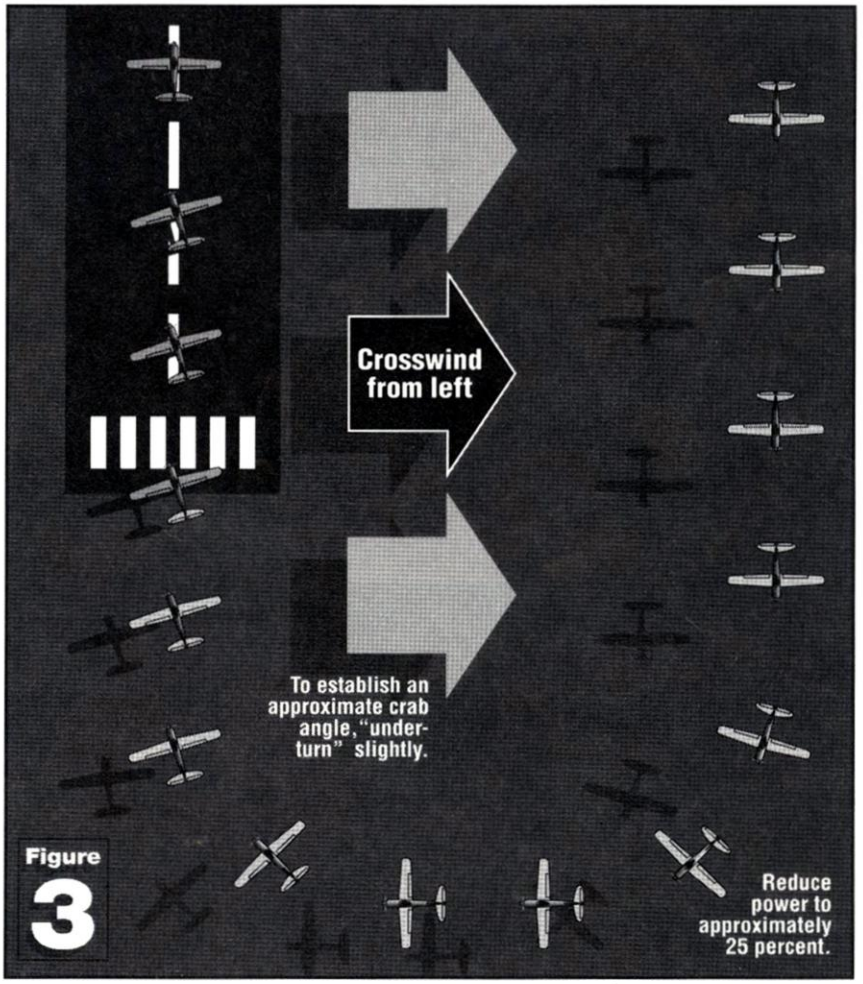
Regardless of conditions, the key to any landing is a good approach. When a crosswind is present, a longer approach is strongly recommended, as this allows you more time to get set up properly and time to settle into the right approach angle. Also, if you end up on an approach that you're not happy with, don't hesitate to go around and try again. Finally, be consistent and fly a rectangular landing pattern every time you land.

HOW STRONG *IS* THIS CROSSWIND?

The strength of the crosswind is determined by its speed and direction. For a given wind speed, the effect of the crosswind on your plane is greatly affected by the crosswind's angle. For example, a 15mph crosswind at 90 degrees to the runway can be quite difficult to contend with; at 45 degrees, it's not too bad, and at 10 degrees, you'll hardly notice it. Make sure you have a clear picture of how the wind will affect your aircraft before you take off.




Typical landing-approach angle of approximately 6 degrees.



THE APPROACH

There are two basic techniques that compensate for a crosswind during a landing approach. The easy way is to establish a natural crab angle so that the track is parallel to the runway, and the fuselage is slightly angled into the wind. The hard way is to side-slip the aircraft with respect to the relative wind by maintaining a heading and a track that's parallel to the runway. (At this point, the fuselage is parallel to the runway.) This is difficult to do from the ground. We're going to focus on the easy way because it's just as effective.

Turning from base into final establishes the crab angle, which is determined by the crosswind. Take a guess, and observe what happens. If, for example, your plane has too much of a crab angle, gently turn the plane to slightly reduce the angle. Don't go overboard trying to yaw or rudder turn to correct, because at low air speeds you may find your plane in a spin–literally. Also, try to keep your approach speed constant from the turn going onto base. A good final approach speed is about halfway between stall and cruise, or at about a 25-percent power setting. Every plane is different, and while you

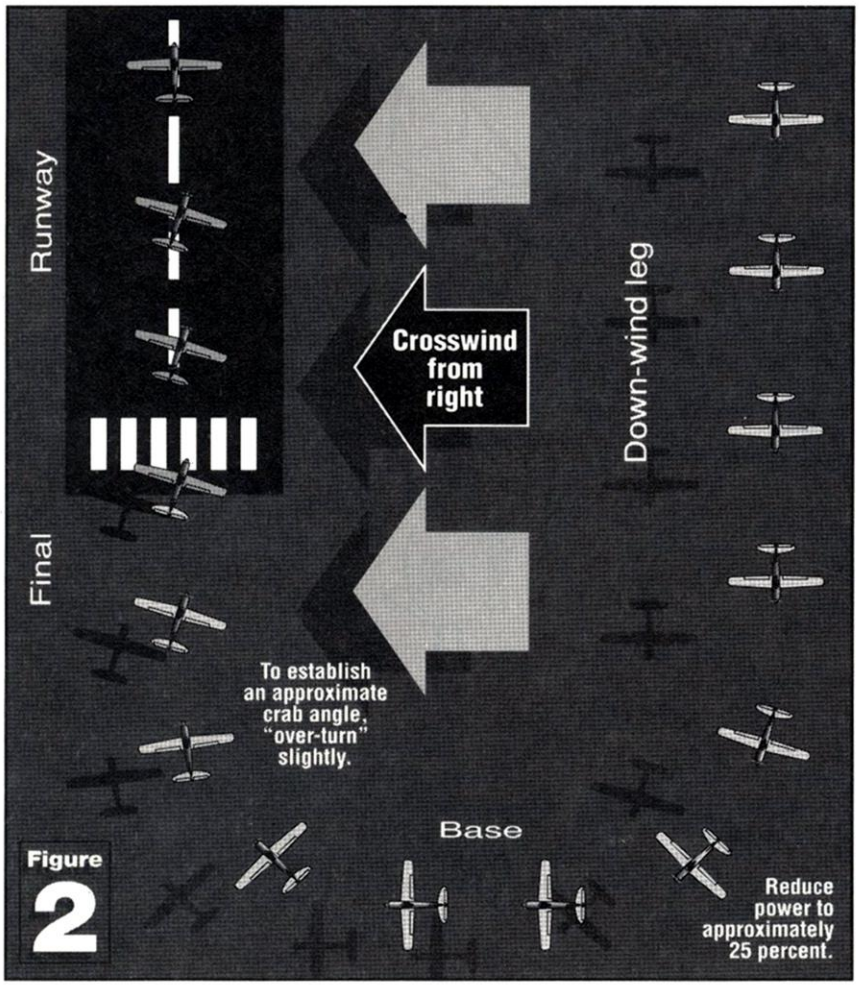


Figure 2

practice, experiment to determine the best approach speed for your particular plane. The stronger the crosswind component, the faster I like to fly the approach.

FLARE

Now that you've flown a nice approach to the runway, it's time to prepare for touchdown. Although the flare will be conventional, it does have a very important twist. You have to add some rudder to get rid of the crab angle that you established during your approach. The best technique is to wait until the last moment before touchdown and apply rudder very gently to reduce the chance of a spin. Applying the rudder reduces side load on the landing gear and establishes a straight roll-out. Keep in mind that wind velocity can be dramatically reduced closer to the ground, so, as you begin your flare, be prepared for loss of lift during the last couple of feet.

THE HARD WAY (SIDE-SLIP)

Assume the wind is coming from the right. To make the plane track correctly, it must yaw slightly to the right, but to side-slip it

(Continued on page 50)

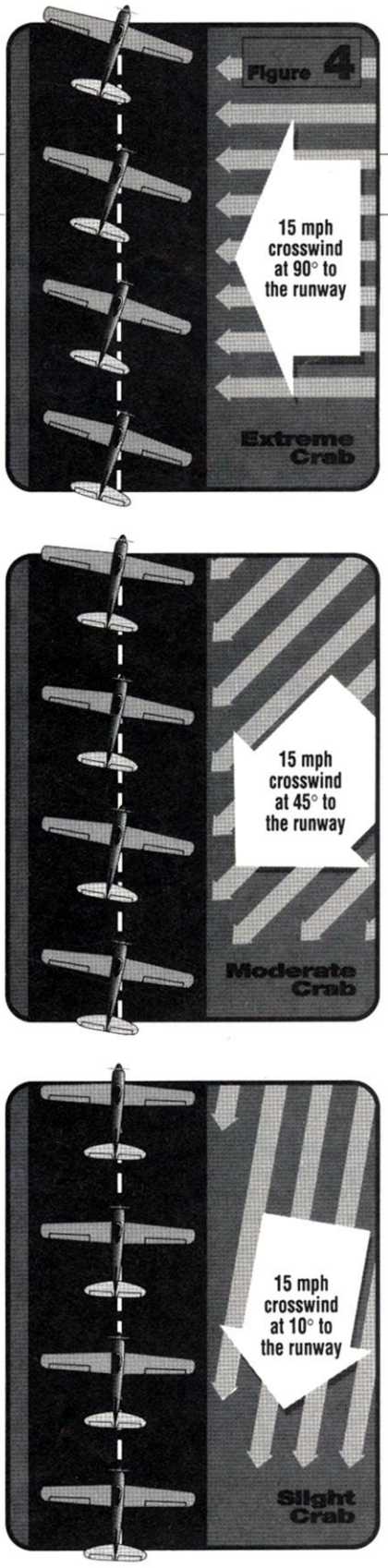


Figure 4

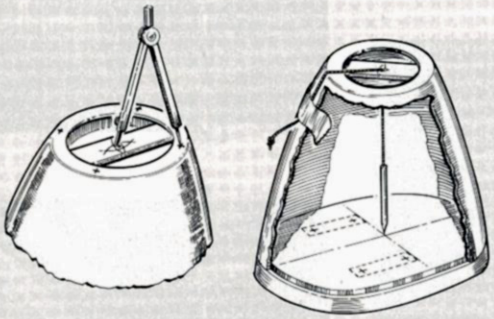
Crab-angle comparisons

The above shows crab angles with a 50mph approach. Notice how much less of a "crab" is required as the crosswind angle decreases.

HINTS & KINKS

JIM NEWMAN

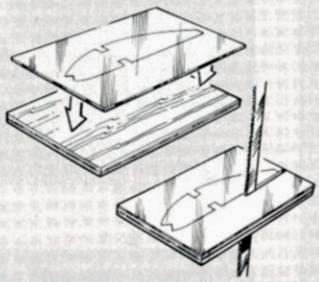
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o *Model Airplane News*, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive,we can't acknowledge each one, nor can we return unused material.



CENTERING COWLS AND MOUNTS

To determine the center of a cowl, tack-glue a piece of wood across the cowl opening, then scribe four arcs onto it from equidistant points on the cowl. Drill a small hole through the center, install the cowl on the model, then suspend a plumb bob through the hole to mark the thrust line on the firewall so that you can position the engine mounts correctly.

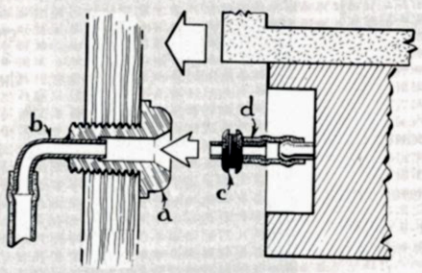
Narendra V. Java, Sharjah, United Arab Emirates



NO-SNAG METAL CUTTING

Templates that you cut from thin sheet metal may have twisted, bent edges. Use double-sided adhesive tape to attach the metal to a scrap of 1/8-inch (3mm) plywood, then cut out the template on a jig or with a band saw. The cut will be clean. Use a thin blade to separate the metal from the wood.

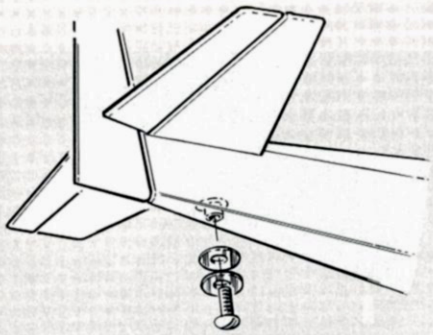
Eugenio Pesarini, Rome, Italy



SELF-ALIGNING PRESSURE TAP

The pressure tap on a pumped O.S. Max is recessed and difficult to access. Drill and countersink a nylon number-plate bolt (a), and screw it through the firewall. Press in a brass tube (b), and seal it with a smear of silicone. Use rubber tubing (d) to connect the engine pressure nipple to a short piece of brass tube; a rubber grommet (c) will hold it tightly. If you set the engine against the firewall properly, the engine will be plugged into the pressure tap when you install it.

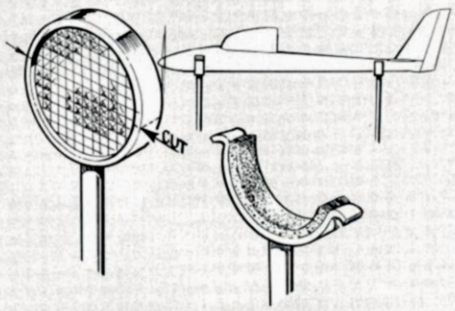
Gaylord McCurdy, Bakersfield, CA



BOLT-ON BALLAST

Glue a blind nut into the bottom of the rear fuselage, then add as many large fender washers as your plane requires for balance. Use a metal machine screw to retain them. A drop of thread-locking compound on the screw is helpful.

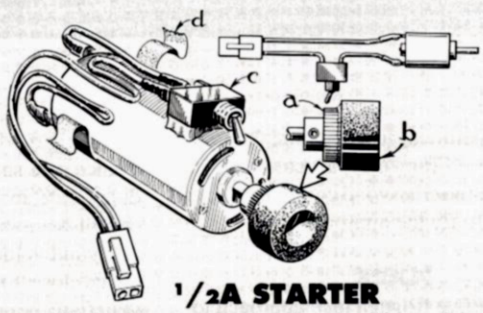
Barry Yoder, Bradenton, FL



FIELD WORK STAND

This simple stand is made of inexpensive driveway reflectors. Just cut the reflector as shown, remove the lens, and pad the metal with foam. You can bend the ends to form hooks for rubber bands. On a breezy day, you might need the rubber bands and a few extra supports that you've made in the same way.

Jerry Jenkins, Plainwell, MI



1/2A STARTER

Glue a small, plumbing-type, hard, rubber ring (b) to a pinion gear (a) and attach this to an 05-size motor. Wire the components as shown, then epoxy or glue a spring-loaded switch (c) to the top of the motor. The wires are wrapped back over the motor case and taped tightly (d) to keep the strain off the connections. You can slip a couple of electric-car slick tires or some foam pipe insulation over the assembly to make it more comfortable to hold. Power the starter with a 7.2V Ni-Cd pack or six D cells.

Michael Bates/Brad Faul, Swarthmore, PA

MULTIWIZ

(Continued from page 18)

transmitted to the rudder. This was elegant, but unnecessary. Experience soon showed that a quick jiggle of the rudder on the way back didn't cause any control problems.

Someone is sure to ask whether the ailerons could be connected instead of the rudder, or whether the Multiwiz system could handle ailerons in addition to rudder and elevator? My experiments have indicated that the answer to both questions is "yes."

Pushrods are my old favorites—round, bamboo, teriyaki skewers with thread-lashed lengths of paper-clip wire that are glued to each end with CA. Don't laugh; it would be difficult to come up with cheaper, stiffer or more adjustable rods for small models! Note how they emerge from slits in the covering in the model's tail section.

FLYING TIPS

To start, the downthrust is $1\frac{1}{2}$ degrees. If you use a really hot .049, you may want to add a couple of thin washers under the top engine lugs. (It also might be a good idea to put the prop on backward for the test flights.) I included a tail wheel for those who like to ROG. Despite appearances, the wheel isn't supposed to swivel or turn with the rudder. Its mount can be easily bent to adjust ground handling. Initial tests with the .020 were ROG, but I soon opted for quick-and-

(Continued on page 50)

SCORPIO TAURUS PLUS

by ART SCHROEDER

I'VE BEEN building and flying model aircraft for 55 years, and during that half century, I've constructed something near 400 airframes of all types. Right now, there are 13 airplanes left in my fleet, which means I've "disposed" of 387. Sure, some were sold or given away, but the wreckage of the others would have made a most impressive pile.

One of the fortunate 13 remaining is a recently finished Taurus Plus from Hobby Lobby*. I expect, given its reliable radio, that the Taurus will last for my next 55 years and never become part of my "pile"; it's that strong and solid! The Taurus quickly became one of my all-time favorites. I'll tell you why; you knew I would!

A PRE-BUILT, ALL-WOOD AEROBAT FROM ITALY

DESIGN

The Taurus is a large sport model with relatively long moments and an 84.5-inch, slightly swept, constant-chord, two-piece wing. Although it isn't a mid-wing, the thick, semisymmetrical wing is deeply inset into the fuselage profile. A large canopy blends into a nicely proportioned rear turtle deck, while the nose is dressed up in a cowl/spinner arrangement with a typical lightplane look. All in all, the design is quite clean.

The stabilizer is generously sized with a constant chord, and it has an elevator that's 25 percent of the total tail area. The ailerons are a "barn-door" style, and the balance of the wing's

PHOTOS BY BILL BUDELMAN

SPECIFICATIONS

Model name: Taurus Plus
Type: sport aircraft
Price: $309
Wingspan: 84.50 inches
Wing chord: 11.75 inches
Wing area: 990 square inches, 6.87 square feet
Wing loading: 28.9 ounces per square foot
Weight: 12.5 pounds
Length: 58 inches
No. of channels req'd: 5 (rudder, elevator, aileron, throttle, flaps)
Power req'd: .60 2C to 1.20 4C
Engine used: YS 120 4C
Propeller: 13.5x12.5-inch APC
Airfoil: semisymmetrical, 16 percent
Wing Construction: two-piece, plug-in, built-up wood

Kit construction: the airframe is an open-bay construction using balsa, plywood and hardwoods. The entire stabilizer/fin assembly is removable. A fiberglass cowl and a heavy-duty, tinted canopy are also used.

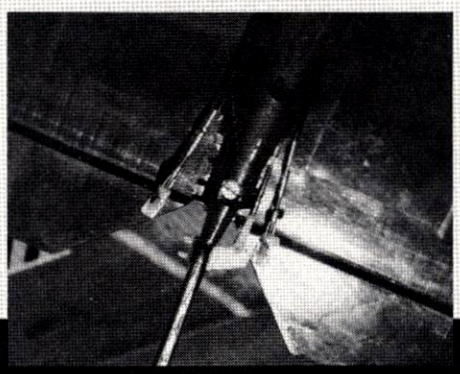
Features: the airplane comes with virtually all the framework completed. It requires only finish-sanding and covering. The hardware is excellent, with one exception. Also included are a pre-formed steel tricycle gear and an outstanding wing/landing-gear mount that uses a 1-inch tempered aluminum tube. The two halves of the plug-in wing are secured with steel bolts.

Hits

- The craftsmanship is outstanding, the design is very attractive and the performance is superb.
- Even though it's very aerobatic, it's also quite predictable with no apparent vices. The huge flaps can be used to generate extra lift, or they can be dropped to a 90-degree position to create high drag, which permits a sharp, nose-down landing approach at low flight speed.

Misses

- The aileron bellcranks, which are molded of a soft material, are unsuitable for such a large, heavily loaded airplane.
- The nose-gear geometry and the actuating cable conduit are poorly designed.
- The 80-percent plan, while well done, would be better and more useful at full size.



A twin elevator connection provides a solid control-linkage setup.

These are all the parts contained in the kit.

SCORPIO TAURUS PLUS

(Continued from page 45)

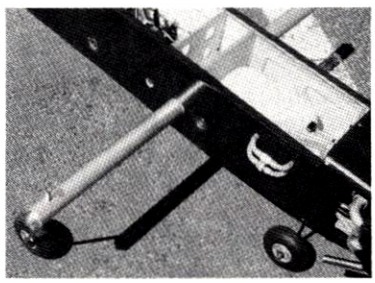
trailing edge is flapped and can be extended to 90 degrees of deflection. The wing and stab are at zero to the datum line, while 2 degrees of engine right thrust are used. A .60 2-stroke or an .80 4-stroke would provide plenty of power, but the airframe's size and style simply screams for a big 120. Such power makes this a sport airplane with "hair"! In fact, the Taurus is such a "horse" that it's recommended as a glider tug for anything up to 16-foot soaring planes. It also would probably make an outstanding TV or still-camera plane.

"THE LANDING MANEUVER IS, PERHAPS, THE BIGGEST CROWD-PLEASER THAT TAURUS HAS IN ITS BAG OF TRICKS."

THE KIT

The Taurus is manufactured by Scorpio, a company in Italy whose fine line of pre-built airplanes once included Hobby Lobby's super Telemaster 2000. I "assembled" (the only accurate term for these Scorpio kits) the Telemaster 2000 several years ago. (Yes, it still lives among the favored 13.) It proved so satisfying that I could hardly wait to get my hands on a Taurus, which is a much more aerobatic design.

Taurus comes in a beautifully packaged, heavy-duty box. All the components—the fuselage, the wing and the tail surfaces—are completely built of specially selected balsa and hardwood. They require minor sanding, and only a few parts have to be installed. All the hardware is included, and the quality is good, except for the aileron bellcranks and the associated pushrods. The bellcranks were too soft, so I replaced them with hard nylon ones, and the pushrods must have had a flaw, since the "Z" ends broke during installation. I soldered clevises to the ends and solved this minor problem.



The combination of the wing mount and the landing-gear support is a very innovative arrangement. Note the external treatment of the fuel lines.

The hardware packets are stored in a separate compartment so that they won't damage the wooden parts. Only a few wheel collars, three wheels, a fuel tank and a spinner weren't included. Of course, the engine, the radio and the finishing materials are the modeler's responsibility.

The instruction book, which was written in four languages (thankfully, English was one of them), was reasonably well done and presented in a very logical assembly sequence. Each assem-

(Continued from page 47)

bly step was supported by isometric drawings. Although the Taurus is easy to build, it's definitely for the modeler who has built several planes.

The blue-line plans are beautifully drawn and scaled to 80 percent of full size. Although it's not a big problem, measurements or tracings can't be taken directly (as suggested in the instructions) without re-sizing to scale. Incidentally, the 80-percent plan could be built by a scratch-builder. It would make a super 68-incher for .60 4C power—sort of a Taurus Minus.

Other items that deserve special note are the big, tinted canopy that's perfectly molded and very rugged and the wing-mounting tube that's machined to accept a variety of fittings and can support much more weight than what's called for in this plane. Not only is the tube a wing mount, but it's also the mounting point for the main landing gear—a very clever piece of engineering. The fiberglass cowl is also well-made and sturdy, and it fits the fuselage. Unfortunately, the surface suffers from the worst case of "pinhole virus" I've seen in years. It took many coats of primer and a lot of sanding to get this part ready for paint.

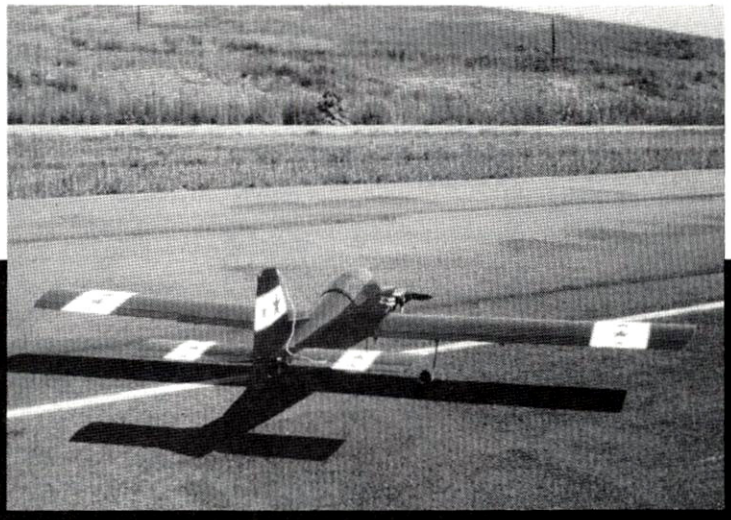
While I'm nit-picking, in my opinion, the project has one design flaw. The rudder servo controls the flight surface and the nose wheel with a single piece of braided cable/tubing that runs from the nose to the tail. The position of the three elements (servo-output wheel, rudder horn and nose-wheel horn) forces you to install the nose-wheel horn on the fuselage side opposite the cable run to ensure that everything is going in the correct direction. This, in turn, requires a substantial curve in the cable to hook up the nose wheel. Limited space and the hardware make this a bear to set up.

When any side load is applied to the nose wheel, the cable's conduit can buckle and cause a severe wheel swing—not a happy occurrence on a takeoff run. I finally solved this by thoroughly epoxying the conduit to the wall and to the (supposedly) removable tank floor. Now, I can't get at the nose-wheel hookup because the tank floor is permanently installed. Had I thought of it at the time, a better solution would have been to use a reversing crank so that I could install the nose wheel on the same side of the cable.

ASSEMBLY

You should lavish tender loving care on the finished parts. They're nicely built, and they only required some minor sanding with 100- to 320-grit paper. A few wooden parts, e.g., the stabilizer plate, the reinforcing gussets, and the fairing strips must be glued to the subassemblies, and you'll have to install the hardware, the wing tube,

SCORPIO TAURUS PLUS



The Taurus has long moments and a wing area of nearly 1,000 square inches—a perfect match for the power of a YS 1.20 4-stroke.

FLIGHT PERFORMANCE

• Takeoff and Landing

Despite the massive torque and "P" factor generated by its big 120 4-stroke and 13.5x12.5-inch propeller, only a touch of right rudder is needed to keep the Taurus on a straight run. Even at 12.5 pounds, the airplane is ready to fly in 100 to 150 feet. Using 15 degrees of flap allows you to take off in even less space. The best-looking takeoffs are accomplished with a smooth application of power and a slight amount of back stick.

The landing maneuver is, perhaps, the biggest crowd-pleaser that Taurus has in its bag of tricks. Without flaps, it lands straight and true like any good pattern airplane. With 15- to 30-degree flaps and a touch of down-elevator, it slows down perceptibly and makes a very soft touchdown possible. With 90-degree drag flap, however, you can make a landing approach from a much higher altitude than normal. Smooth application of full flap and corresponding application of down (1/2 stick or more) puts the Taurus into a 45-degree nose-down attitude and sharply decreases forward speed. It's something to see this approach angle at low speed with the nose pointing toward the spot and little forward progress. Just before touchdown, down stick is relaxed and the Taurus comes down like a feather with very little roll-out. One thing's for sure: the whole landing experience with flaps hanging out gives me much the same feeling as landing a full-scale light plane.

• High-Speed Performance

Ailerons give a nice 2-second roll with little need for down-elevator in the inverted portion. I initially had a barrel quality to the rolls but some differential cured this. The elevator tends to be more sensitive to up than to down. I haven't corrected this, but it may be wise to run some differential on the surface biased toward down. The model is "neutrally" stable and doesn't require a trim change when it's flown at high speeds. It has no snapping tendencies in a fast, tight turn.

• Low-Speed Performance

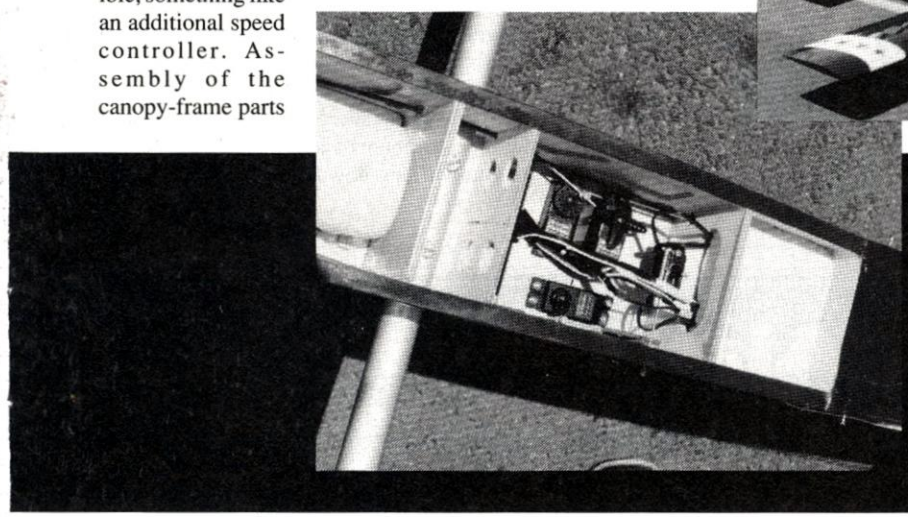
Always remember: the full-flap position is really a huge air brake. In low speed, snaps are even more difficult. The airplane simply doesn't want to stall. Part of this is the result of stall strips that are installed at the wing root. As you know, stall strips (the ones on the Taurus are 6 inches long and installed about 3 inches outboard of the fuselage sides) cause turbulence over the portion of the wing to which they're

the motor, the radio gear and the landing gear.

Install the flaps exactly as shown. You'll love them, and they work well. If, however, you install the flap servo and linkage as shown, you'll need a clockwise servo and a counterclockwise servo. I simply performed electronic surgery on one to reverse it. You might opt for one of Ace's* servo reversers. Please note that your servo-direction switches won't solve the problem; you must have servos that move in opposite directions. The flaps can be actuated by a position switch, but I have them on a proportional channel (the prop-pitch control on my Futaba system). With proportional, I believe the flaps are much more flexible, something like an additional speed controller. Assembly of the canopy-frame parts must be very accurate for the unit to fit with no unsightly gaps. It's not hard to do; trust me!

When you install the wing halves, it's important that both panels have exactly the same incidence; don't permanently install the metal bushings until all is perfect. A Robart* incidence meter eases this task. Make sure that the stabilizer is square to the wing both in span and chord. If you don't do this, your sport plane with "hair" could become a "hairy beast" to trim.

All installations should be completed before you decide on the covering. Normally, on a plane this heavy and powerful, I'd opt for a painted fabric covering such as silk, Coverite*, or one of the "tex" materials. I didn't want to add weight by using paint, and this is a sturdy structure that's capable of handling any load without help from the covering. I chose Black Baron* with Presto* trim, and I don't regret the decision. The bird is easy to cover, with no tough compound curves, but it uses a lot of film. It's a good idea to coat all the exposed wood with resin, i.e., the wing-root profile, the radio compartment and the trays, the fuel compartment and the firewall face. This bird will last so long that you won't want fuel intruding on your happy relationship with Taurus, and that's no bull!



▲ *Art, a survivor of a half century of modeling, says the Taurus is quickly becoming his favorite model.*

◀ *There's enough room in the fuselage for an elephant! Any two radios will fit.*

FIREWALL FORWARD

You'll have to decide on a soft or a hard mount. The 1/2-inch-thick, multi-ply firewall would lend itself to any soft-mount system, but I remain unconvinced about purported soft-mount advantages. Perhaps, I just don't like to see "a whole lot of shakin' goin' on"! In any event, my Taurus has its YS* 120 hard-mounted to a Tatone* aluminum firewall mount that uses a 1/2-inch-ply standoff to put the spinner in the right spot on the cowl. The cowl is pre-molded for the right offset of 2 degrees. The 2.5-inch CB/Tatone aluminum spinner fits reasonably well, although the cowl molding is really made for a metric spinner. The hard mount hasn't caused any problems that I can see. I keep the problems of vibration to a minimum by wrapping my receiver and battery pack with plenty of

(Continued on page 60)

attached. As the wing's angle of attack increases the portion of the wing directly behind the strips will stall before the rest of the wing. This makes the wing root stall first and precludes tip-stall. If you want good snap rolls, the stall strips must be omitted. I kept them.

Final flap note: I wouldn't deploy full flap at normal flight speeds or in a dive (why one would want to is beyond me), because it's possible to rip the flaps off.

• Aerobatics

While it's not a full-fledged pattern airplane (it's too heavy and, in some respects, too stable), the Taurus can do every maneuver in the book. Loops, rolls, Cubans, rolling circles, top hats, stall turns, avalanches, squares, point rolls and inverted flights are easy to do and relatively precise. While it wouldn't be competitive against the many well-designed pattern machines, it, nevertheless, is no slouch in a disciplined pattern, and it's a lot of fun extracting the max out of such a big, heavy plane. Even at 12 1/2 pounds, vertical performance is quite good, and it can be flown in winds that would ground more lightly loaded pattern birds.

Three maneuvers aren't easy, and they take a lot of practice; one may be nearly impossible, and all for good reasons, as I see it. Spins are difficult and require perfect timing with rudder and aileron when the airplane stalls. Full control must be held on all control surfaces, or the Taurus immediately enters a spiral dive—all a part of that stability I've spoken of in the review. Snaps are also very difficult, particularly inside snaps. I can't make my Taurus snap upright in high speed, but it's fairly easy to do an outside snap. Both spins and snaps could also be improved by moving the CG back another 1/4 inch; I haven't gone beyond the rearmost suggested point but I plan to. Finally, knife-edge is all but impossible, and I believe this stems from the airplane's overall weight. The use of a hot .90 2-stroke engine might help extended knife-edge, but it's not all that important to me. The Taurus holds attitude well enough to handle a nice-looking four point.

The difficulty in entering spins and snaps translates to very easy handling at slow flight speeds. The airplane simply never gets "stupid" at low-speed, high-angle of attack situations. Stalls are always straightforward with neither tip dropping. This is one airplane that accepts just about any "ham-fisted" flight style any pilot might throw at it. This isn't to say you can dead stall it 10 feet off the runway; the airplane will fall. The difference is that the wings will be level at the crash site.

The Taurus is great for the active Sunday flier who wishes to develop his piloting skills and impress others at the field.

MULTIWIZ

(Continued from page 42)

easy hand-launching instead of bumping over an asphalt country road.

The Multiwiz should be launched with its nose well up—15 to 20 degrees is fine and leaves plenty of room to correct any tendency to dive or stall. Assuming that all surfaces are according to the plan, you can trim the plane for flight by moving the battery pack.

I hope you enjoy flying the Multiwiz using just one control stick for full proportional control. It's sure to surprise others at the flying field!

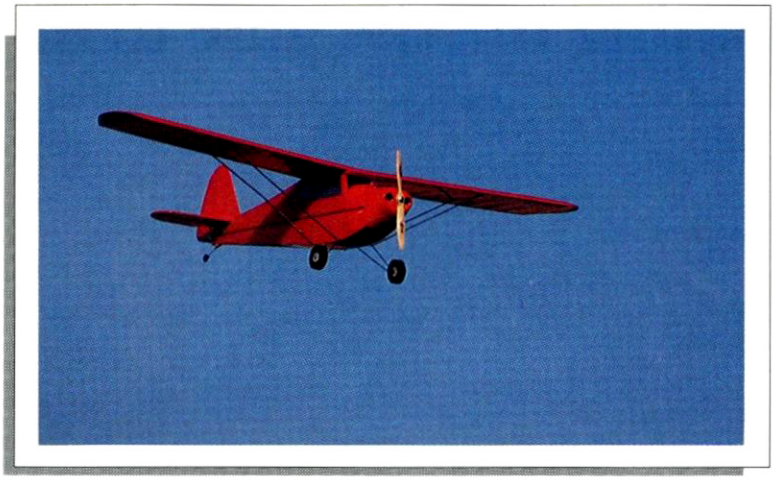
**Here are the addresses of the companies mentioned in this article:*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92617.*
Cox Hobbies, *350 W. Rincon St., Corona, CA 81720.*
Du-Bro, *480 Bonner Rd., Wauconda, IL 60084.* ■

AEROBATICS MADE EASY

(Continued from page 37)

properly, you must add enough left rudder to straighten the fuselage's relative alignment so that it's parallel to the runway. To compensate for the rudder-induced turn, add opposite aileron (here, right aileron). Now you have a significant amount of additional drag, and the airplane will slow down to the point of stalling.

(Continued on page 60)



MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW

LARGE-SCALE ELECTRIC

The deluxe kit comes with an Astro Geared Cobalt 25 motor, which has exceptionally good power output on 14 cells. It's a good choice for a model of this size.

Astro Porterfield

by JOHN LUPPERGER

THE ASTRO Flight* Porterfield is a 1/6-scale model of the Porterfield CP-50 Collegiate that went into production in 1935. This stable, slow-flying model is very light and strong, and it's an excellent scale or sport trainer. Because the Porterfield is built like a typical old-time model, it requires the skills of an experienced modeler.

THE KIT

The kit consists of machine-cut and sanded parts, sheet wood, a bundle of sticks, bent wire for the landing gear, a vacu-formed cowl, clear acetate and a basic hardware package. The quality of the wood in my kit was good, and most of the parts fit well.

The wood was mostly medium hard, which was perfect for the light structure of the model. The two-piece, vacu-formed ABS cowl was heavy enough to be workable without worrying about breaking it. I found the full-size, rolled plans hard to follow(I don't recommend this kit for beginners), and the instructions are sparse, at best.

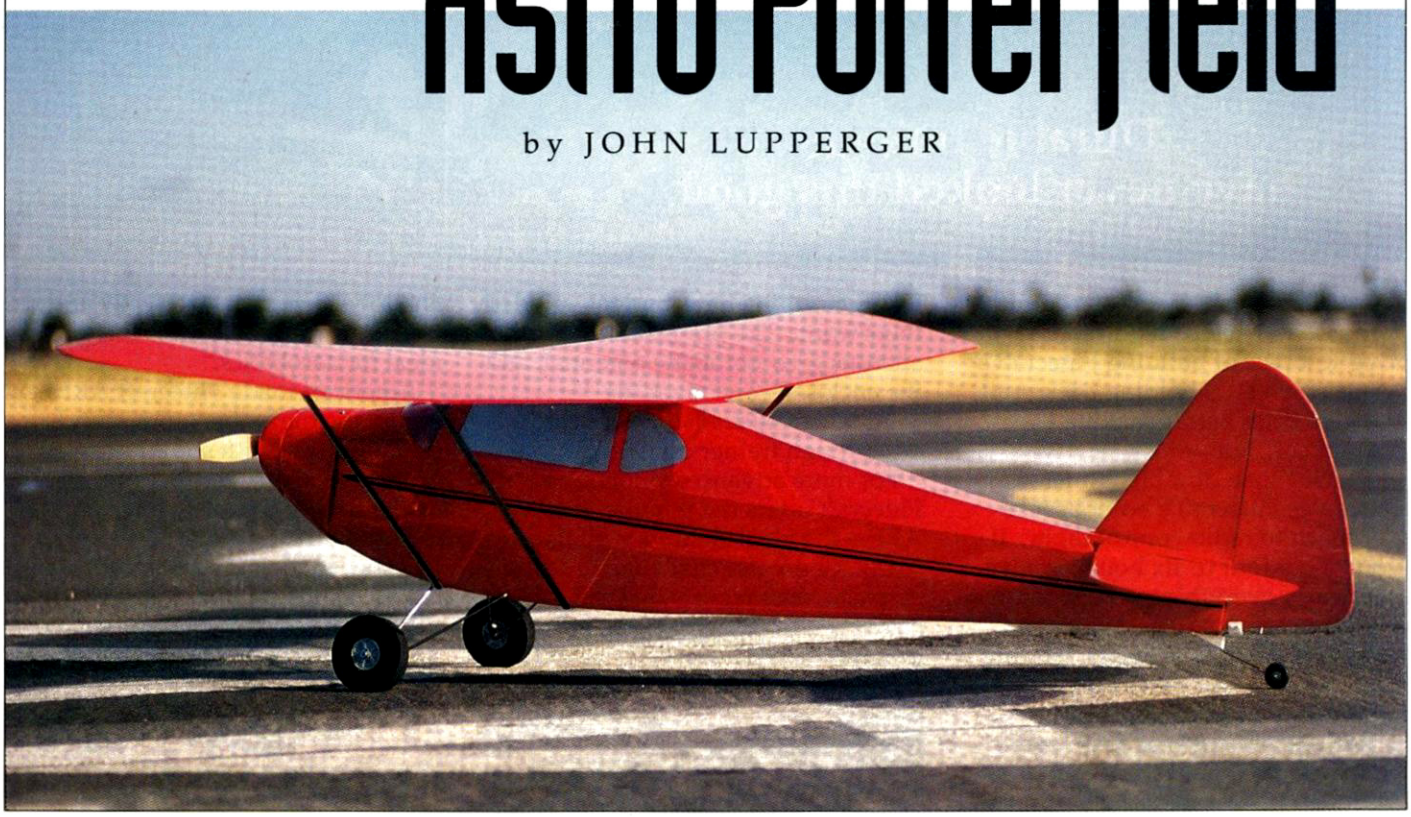
CONSTRUCTION

The first page of the eight-page instruction booklet details the model's origin, design and documentation sources, and it contains a chart that compares the full-size dimensions with that of the model. The next page has a scale, three-view drawing with the dimensions of the full-size Porterfield.

The next four pages contain 32 construction photos with short captions under each. The construction photos don't always follow the instruction sequence, so you have to jump around to find the picture that corresponds to the step.

The seventh page includes a detailed history and description of the full-scale aircraft and a specification chart of the model. On the last page, there are only two columns marked "Construction," which doesn't give you much to go on.

Construction starts with the fuselage, which is a stick structure



PHOTOS BY JOHN LUPPERGER

FLIGHT PERFORMANCE

- **Takeoff and landing**

The Porterfield is only my second model that uses a powerplant larger than an 05 motor, and I was nervous about the first flight. There was no need for the jitters, however, because the Porterfield is one of the nicest flying power-style electrics I've ever flown. Prior to the Porterfield, I had no tail-dragger experience, so for the initial flights, I used a Futaba standard gyro on the rudder. Eventually, I turned the gyro off and took off on my own. I found that if I advanced the throttle slowly, the Porterfield required only a small amount of right rudder to keep it on a straight heading. When the speed came up, the right rudder was let off, and the model tracked straight down the runway. Once reasonable speed had been reached, the model could lift off with just a touch of up-elevator for a very scale-like takeoff.

To land, it's a good idea to chop the throttle quite a way out (the model seems to glide forever),or reduce the throttle to about one third, fly it to the deck and chop the throttle just as you flare. I've overshot my landings several times, and if you've used all of your battery power (as I had), you have no choice but to land at the far end of the flying field or runway.

- **High-speed performance**

The Porterfield is by no means a speed merchant. Its flight performance lies somewhere between a sport trainer and an old-timer. At full throttle, it moves along nicely and is fairly agile. When it flies "fast," it turns better than you'd expect for a model with only 1 1/2 inches of dihedral under each tip. At full throttle, the 900mAh battery pack provides a little more than 5 minutes of flight time, and the 800mAh pack provides almost 4 1/2 minutes of run time.

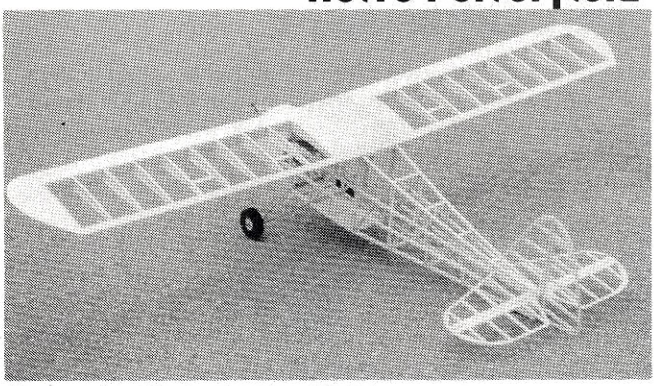
- **Low-speed performance**

At low speeds, the Porterfield shows what an excellent trainer and leisurely sport model it really is. My model came out 1 pound heavier than the prototype discussed in the instructions. Built in the late '70s, the original was built with contest-grade balsa, used a ferrite motor, and it was powered by 550mAh batteries. I could have knocked 3 or 4 ounces off by going to smaller radio gear, but the Porterfield flies well at this weight and even thermals with a wing loading of 17.1 ounces to the square foot. It can maintain flight at a very low throttle setting (which greatly extends run time) for extremely slow flight. One of my longest flights to date when thermaling and gliding power off was just over 21 minutes. When the model is forced into a stall, it simply drops its nose a little and continues to fly. Great characteristics for a trainer!

- **Aerobatics**

The Porterfield is an excellent trainer, but like all good trainers, it isn't an aerobatic model. Yes, it can do loops; it can even execute them from level flight, but the rest of the aerobatics should be left to the sportier, aileron-equipped models. I did manage to do some rather strained, very slow rolls, but this was more of a chore than fun. The Porterfield was meant to be flown in a leisurely manner, and it does this very well!

Astro Porterfield

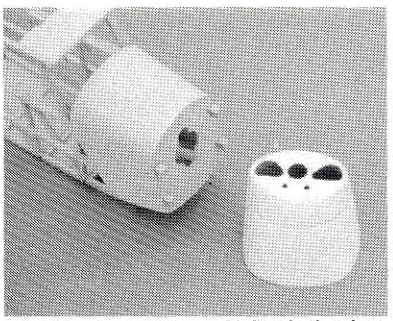


The framed-up structure is very pretty and reminiscent of a typical old-time model. This type of structure is strong, light and perfect for an electric model.

that's typical of old-time models. Eighteen of the photos cover the fuselage construction, and they should be studied very carefully. I've never built an old-timer before, so it was necessary for me to study the photos closely while framing the fuselage.

The stick fuselage sides are made of 1/4-inch-square balsa that are placed directly over the plans. With the fuselage inverted and the wing-saddle area flat on the working surface, the two sides are joined with cross members. Be sure to keep the sides square, and frequently check your work with a triangle as you glue the cross members. (To help reduce the weight, I used CA for all the stringer and cross-member joints.) The firewall is then epoxied to the front of the fuselage.

The bottom, front stringers are glued in place and notched for the landing-gear tubes. The tubes are then epoxied to the cross members, and the 1/16-inch plywood floor is glued in place. (The floor supports the batteries, so use plenty of epoxy here.) The side, top and bot-



The finished cowl is attached to the fuselage with screws that go through hardwood-mounting blocks. The mounting blocks had to be moved to the top and bottom of the firewall to allow for the cowl's curvature. Motor hole was opened to fit Astro 25, two cutouts were made to allow clearance for brush-housings.

SPECIFICATIONS

Model name: Porterfield Deluxe

Manufacturer: Astro Flight

Type: electric sport scale

Price: $249.95

Wingspan: 69.5 inches

Wing area: 672.2 square inches

Wing loading: 13.6 ounces per square foot (review model: 17.1 ounces per square foot)

Weight RTF: 64 ounces (review model RTF: 89 ounces)

Length: 45.5 inches

No. of channels req'd: 3 (rudder, elevator, motor control)

Radio used: Futaba 4NBF Conquest; 2-S148 servos; 500mAh airborne battery; Astro Flight 205 speed controller.

Motor used: Astro Flight Geared Cobalt 25 (included)

Battery: 16.4V, 800/900mAh battery pack

Prop used: 12x6 Zinger*

Features: this plane features all-balsa construction, and it's engineered to be lightweight. An Astro Cobalt .25 geared motor and a two-piece ABS cowl are included.

Hits

- It's extremely easy to fly.
- Performance is equal to a glow-powered model for a plane of its class. (It offers performance between that of a sport trainer and an old-timer.)

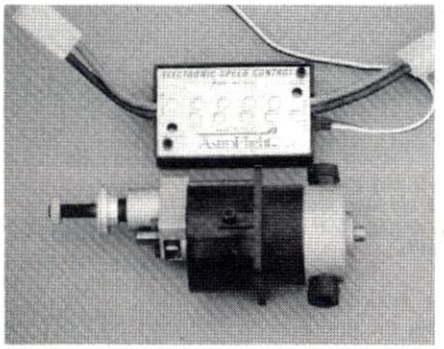
Misses

- The plans aren't easy to follow, and most beginners won't find them adequate.

Astro Porterfield

tom stringers that fair everything together are then glued in place.

The F-1 bulkhead at the front of the fuselage is glued in place to support the 1/16-inch front fuselage sheeting. The sheeting is glued to each side and carefully bent over the top of F-1 and the firewall; then it's trimmed. Although it isn't shown on the plans, it might be good to run a stringer between F-1 and the firewall where the sheeting is joined to support the center joint.



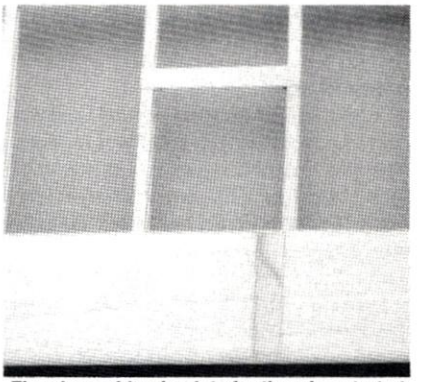
The heart of the flight system—the Astro Geared Cobalt 25 and high-frequency 205 ESC.

The wing dowel, plywood hold-down plate and bolt plate are glued in place in the wing saddle. The F-2 balsa plate is glued to the front of the fuselage to support the top of the windscreen, and the entire fuselage is finish-sanded. Refer to the pictures, as many of the stringers are tapered during final sanding. Like much of the building information I've mentioned in this article, tapering the stringers isn't included in the instructions, so experienced builders will have to draw on their own knowledge.

The kit's landing gear is different from that mentioned in the instructions, but it matches what's on the plans. The two pre-bent wires for each half of the landing gear must be wrapped with wire and soldered. The two separate gear assemblies then slip into the tubes in the fuselage, and that makes them easy to remove for transportation and easy to straighten after a rough landing.

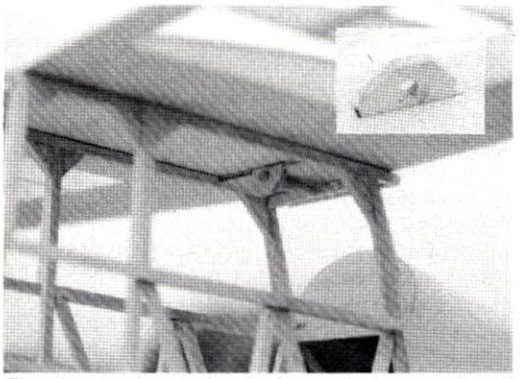
A plywood plate is glued to the rear of the fuselage for the tail-wheel assembly. After the wire has been inserted through the nylon mount, it's bent into shape. The wire is glued to the bottom of the rudder during the final assembly.

The ABS cowl is made of a front section and a rear ring. The front of the rear ring section is cut out, and the front cap fits directly over it. If you have access to MEK (methyl ethyl ketone), this is the best "glue" for joining the two parts because it melts the materials slightly and "welds" them together. No method of attachment is given for the cowl, so I decided to use hardwood blocks glued to the firewall and small servo-mounting screws (the type with the washer as part of the head). The prop-shaft hole and the airflow holes are opened up and finished off with a file. One hole is shown in the firewall for a cooling air inlet, but I decided to drill a couple more for additional airflow through the fuselage.



The plywood hard points for the wing-strut attachment include two insets in the D-tube leading-edge sheet and two in the rear in the notched ribs.

The wing is relatively easy to build because it's a conventional D-tube structure with capstrips. The instructions suggest that you build a little washout into the wings to give the model a gentler stall, but there are no details on how to do this. I planned to twist the washout in after covering the wings with MonoKote. Since the model has a constant-chord wing, which generally stalls straight ahead and quite predictably, I opted to build the wing flat.

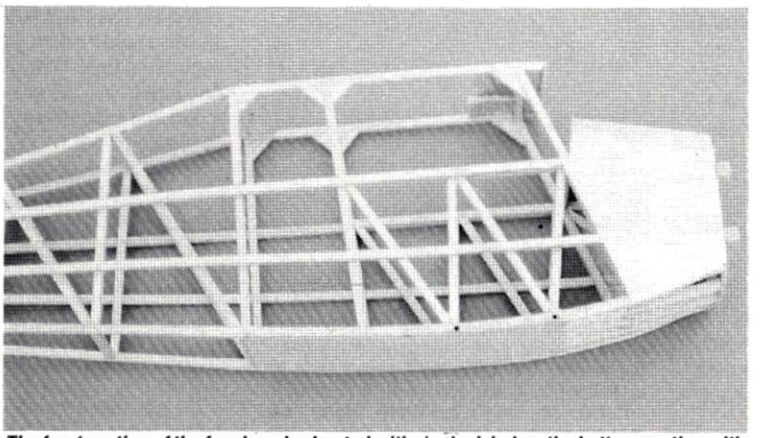


The wing-attachment plate is glued to the lower surface of the wing's center section. The dowel in the fuselage slips through a hole in the plate, and the rear of the wing has a bolt attachment.

The wing is quite robust with 1/8x3/8-inch spruce spars and 1/16-inch balsa shear webs all the way out to the tip. The center section that sits on the fuselage is flat, and the two panels start their dihedral angle at the edge of the fuselage rather than at the center of the wing. The dihedral brace is made of 1/8-inch five-ply plywood, which creates a strong joint. The center section and one bay of each panel is sheeted with 1/16-inch balsa. The center section's trailing edge is sheeted with 1/16-inch plywood for the wing-bolt attachment. The dihedral joints are shown on the plan as glassed with 1/2-inch fiberglass tape. I used 1-inch tape for this because I felt it would spread the load over a larger area. To attach the struts, four plywood "hard points" per wing panel are used. The front hard points are set flush with the wing sheeting, and the two rear ones fit in notches in the appropriate ribs. The struts are attached to these hard points and to the fuselage plywood floor with self-threading screws.

The 1/8-inch, plywood, wing-attachment plate is glued to the front of the center dihedral brace. A slot is cut in

(Continued on page 90)



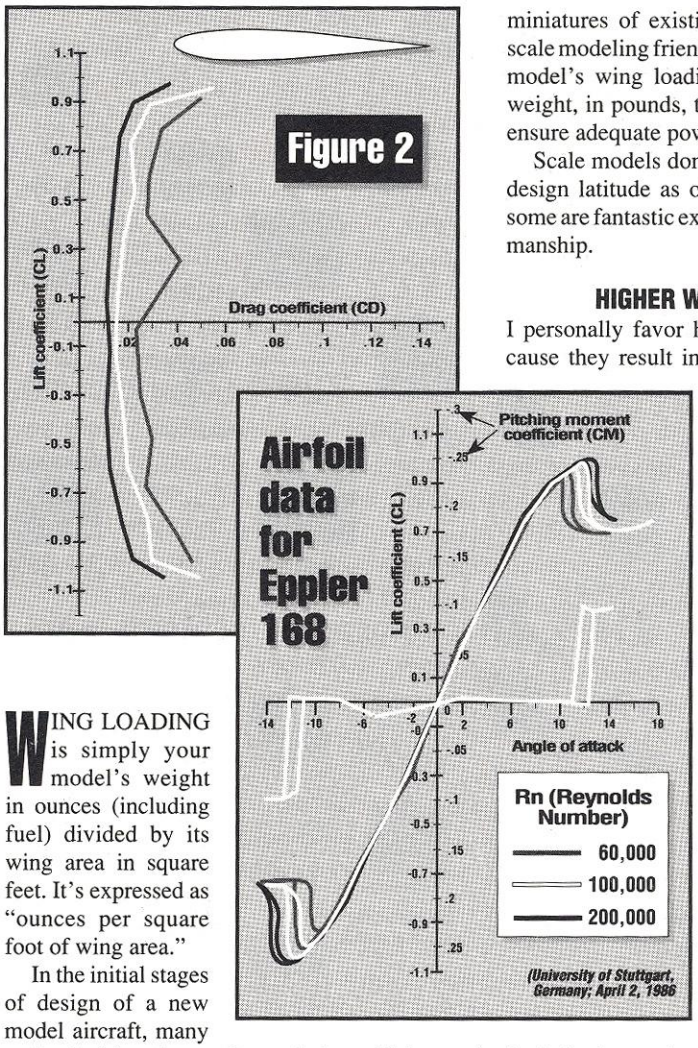
The front section of the fuselage is sheeted with 1/16-inch balsa; the bottom section with 1/16-inch plywood.

HOW TO

Wing Loading Design

Improve flight performance by properly loading your model's wings

by ANDY LENNON



WING LOADING is simply your model's weight in ounces (including fuel) divided by its wing area in square feet. It's expressed as "ounces per square foot of wing area."

In the initial stages of design of a new model aircraft, many major decisions have to be made that will determine its ultimate size and configuration:

- the size and make of engine (if any);
- the type of performance goals sought; (basically, is it a sport model of moderate speed and maneuverability or one that's fast and aerobatic? As a glider, is it a thermal seeker or a fast, sleek, aerobatic sailplane?);
- the wing planform (straight, tapered or elliptical);
- the airfoil;
- the estimated weight.

Your model's wing loading is one of these major decisions—and should be "performance-objective oriented."

Wing loadings vary widely; gliders and sailplanes have wing loadings that range from less than 10 ounces per square foot to 15 ounces per square foot. Sport models are usually in the 15 to 20 ounces per square foot range. Pattern models have wing loadings from 23 to 26 ounces per square foot. Scale models are miniatures of existing aircraft. None of my scale modeling friends knows or cares what his model's wing loading is. They relate gross weight, in pounds, to engine displacement to ensure adequate power.

Scale models don't often involve the same design latitude as other types of model, but some are fantastic examples of excellent workmanship.

HIGHER WING LOADINGS

I personally favor higher wing loadings because they result in smaller, stronger, faster and—if you're careful in the design and construction phases—less "draggy" aircraft.

Higher wing loadings, however, result in higher stall and landing speeds. Level flight requires greater speed or a higher angle of attack. The most serious impact of a higher wing loading is on centrifugal loads when engaging in a maneuver that involves heavy elevator action. Such maneuvers include tight turns, sharp pull-ups or dive-recoveries.

An advantage of a higher wing loading is that, at any given speed, the wing must operate at a higher lift coefficient that's further up the slope of the lift curve and closer to the stall. Entry into maneuvers that involve wing stalling, such as spins, snap rolls and avalanches, is more readily achieved.

Once you've estimated your design's gross weight (with fuel) and decided your wing-loading, the wing area (in square inches) is simply:

$$\frac{\text{model gross weight (ounces)}}{\text{wing loading (ounces per square foot)}} \times 144$$

LANDING SPEEDS

Wing loadings and landing speeds are closely related. Refer to Figure 4, and read up from the 16 ounces per square foot point at the bottom of the chart to the lift coefficient of 1.00 (most airfoils' CL max is close to 1.00). On the left side of the chart, you'll see that the stall speed is 20mph. Do the same thing on the 36 ounces per square foot line, and you'll see that the stall is 30mph. Adding a "safety margin" of 20

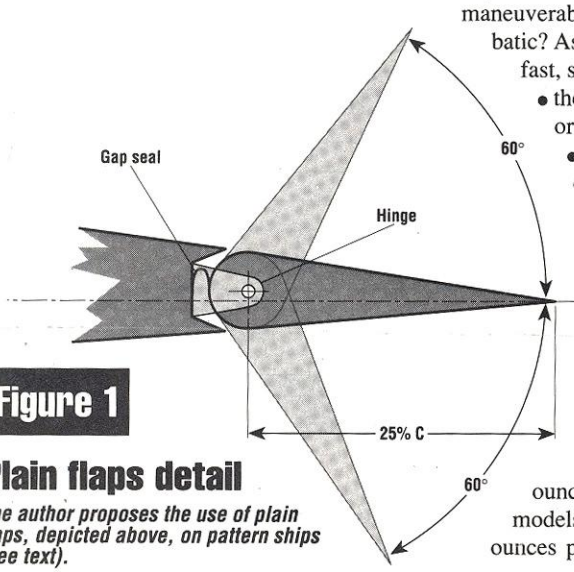


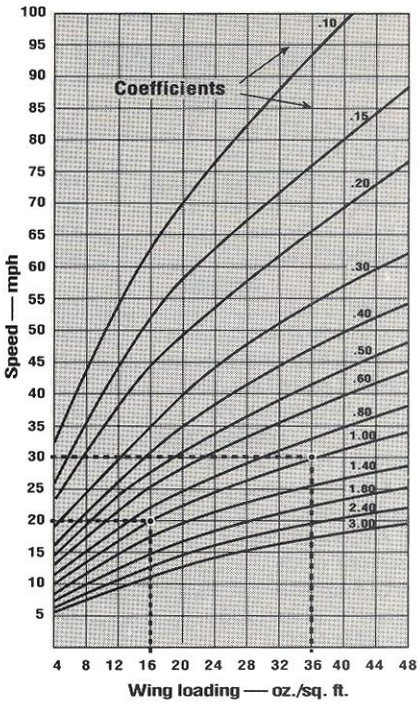
Figure 1

Plain flaps detail

The author proposes the use of plain flaps, depicted above, on pattern ships (see text).

Figure 4 Curves for quick estimation of speed

From wing loading at the bottom, read vertically to the applicable lift coefficient and then move left (horizontally) to find the speed in miles per hour. The stall speed is based on an airfoil's maximum lift coefficient.



percent to each stall-speed estimate results in landing speeds of 24 and 36mph. The latter is too fast for comfort.

CENTRIFUGAL FORCE

Centrifugal force is expressed in multiples of "G", where 1G is normal gravity. Its formula, including the model's 1G weight, is:

$$N = 1 + \frac{(1.466 \times mph)^2}{R \times G}$$

Where:
N = load factor in "G"s
mph = speed in mph
R = maneuver radius in feet
G = acceleration of gravity (32.2 feet/second per second)

Aerodynamically clean model aircraft that have powerful engines and are correctly "propped" can achieve very high speeds. The norm for pattern ships is 100mph. My "Swift" is estimated to have a top speed of 90mph; its gross weight estimate is 100 ounces, and its wing loading is 24 ounces/square foot. At 90mph, it flies at a lift coefficient of CL 0.072.

In a steep turn of a 50-foot radius, the load factor would be

$$N = 1 + \frac{(1.466 \times 90)^2}{50 \times 32.2} = 11.8\ Gs$$

In this maneuver, the Swift's wing has to lift 11.8 x 100 or 1180 ounces—a shocking 73.75 pounds.

Just think what this means both aerodynamically and structurally. This is why I favor stiff, strong, fully sheeted and stress-skinned structures.

The lift coefficient in this turn would increase 11.8 times to CL 0.85, well within its E197 airfoil's capacity (see Figure 3) of CL max 1.17. There's a healthy margin before the stall.

If the Swift's airfoil were E168, as in Figure 2. with a CL max of 0.98, however, then this margin would be greatly diminished.

It's impossible to gauge accurately the max of 1.9, its landing speed is 21mph. Flaps thus eliminate the adverse effect that higher wing loadings have on landing speeds.

In high-speed, short-radius turning maneuvers, 20 degrees of flap deflection would increase the Swift's CL max to 1.6 (from flaps-up 1.17). Tighter turns are possible without danger of a high-speed stall. The Swift's sturdy flaps are strong enough to accept this treatment.

The Swift wasn't designed to be a stunt model; it's a "sport-for-fun" model with a wide speed range and low landing and takeoff speeds, i.e., with flaps deployed. Its slotted flaps aren't suitable for the wide range of aerobatics that pattern ships perform, both upright and inverted.

PLAIN FLAPS

Plain flaps (Figure 1), however, in wings with symmetrical airfoil sections, such as E168 (Figure 2), that are standard on pattern models, would function equally well angled down (for upright flight) or up (for inverted flight). They achieve their CL max at 60 degrees of deflection and would add an additional CL of 0.62 at that angle, plus additional drag to slow the model. At then the fully deployed flap at 60 degrees would provide a wing CL max of 1.30 and, at 20 degrees of deflection, a wing CL max of 1.13.

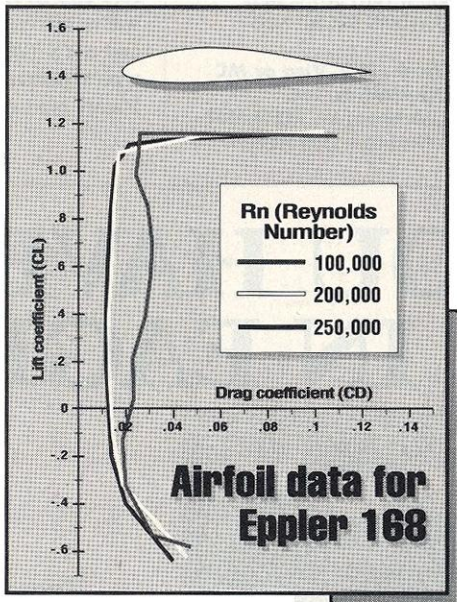
The pilot could extend these flaps up or down at any angle to suit the maneuver in progress. Landings, with a 60-degree flap deployment, with a high wing loading of 28 ounces/square foot, would be at 28mph—a comfortable speed.

In addition, for sharp-turning maneuvers, lowering these flaps partially to 20 degrees would prevent high-speed stalls.

At 100mph in level flight, a lift coefficient of CL 0.068 is required. For a turn radius of 50 feet at 100mph, the load factor would be 14.34 Gs. This calls for a lift coefficient of CL 0.97, which is dangerously close to the E168's CL max of 0.98. The 20-degree flap deflection would provide a CL of 1.13, which would be safer.

With flaps up, the higher loading would move the level flight lift coefficient higher up the lift slope, closer to CL max. In turn, this would provide easier entry into any maneuver requiring that the wing be stalled.

A .60-powered pattern model that weighs 8 pounds (128 ounces), and has a wing loading of 28 ounces/square foot would



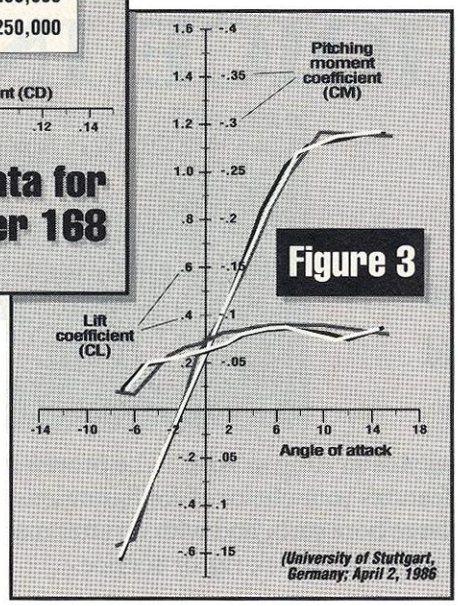


Figure 3

AEROBATICS MADE EASY

(Continued from page 50)

To prevent this, apply down-elevator to maintain the airplane's approach speed. This will generate a steeper approach angle. Add power to return to the original approach angle (about 6 degrees). It's a complicated maneuver that requires a lot of mixing of the right amount of control inputs. Side-slipping on approach in a crosswind can make for a very busy approach!

There's really no need to be grounded when there's a crosswind. Once you've mastered the proper techniques, you'll be surprised at how well your plane handles.

If you have any questions about flying or aerobatics, drop me a line, care of *Model Airplane News*, and I'll do my best to answer them. Until next month... ■

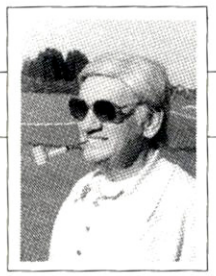
TAURUS

(Continued from page 49)

natural rubber and by properly tightening the servo screw. With the Hatori* pipe and manifold and an APC* 13.5x12.5-inch prop, there was no discernable difference between my setup and a YS 120 operating on a soft mount in a typical pattern bird at my field. By the way, the Hatori pipe does a great job of quieting the

(Continued on page 86)

GOLDEN AGE OF R/C



HAL DeBOLT

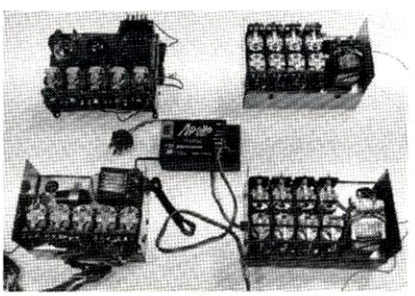
TWO OLD-TIMER R/C ORGANIZATIONS

GOOD NEWS! Officially, as of last October 12 and 13, we now have two OTR/C organizations! We should be aware that the Vintage R/C Society* has been operating for several years under John Worth's leadership, with a steadily growing membership. The objectives are to promote OTR/C in all its facets, provide an information/plan source and advance camaraderie through meeting and flying events. The organization has been well received and dispenses info through its VR/CS Newsletter edited by Art Schroeder.

The new kid on the block is the Senior Pattern Association* (SPA)—conceived and organized by Mickey Walker of Smyrna, GA, and his North Georgia Flying Circus Club. With a well-attended, successful, first contest/meeting last October (see report in February '92 *Model Aviation*), this organization seems to be off and running also. With the excellent membership already seen, it's felt that many of you would be interested in the details.

The Senior Pattern Association objectives:

- To keep R/C pattern fliers active as they age and to encourage older dropouts to return to the sport.
- To promote the flying of R/C pattern designs conceived before 1970.
- To provide competitions for SPA-style R/C models.
- To establish SPA chartered clubs nationwide.
- To create and provide necessary rules and regulations for contest flying.



1. Compare reed receivers of the '50s with the modern receiver in the center. Top left: Schmidt 5-channel. Bottom left: Citizenship 5-channel. Upper right: Vana Orbit copy. Lower right: Orbit 8-channel.

The winners line up at the first SPA meet. Excellent turnout and planes that match many modern designs in looks and performance.

With one event already in the books, it should be obvious that rules and regulations have been established, and the success of this first meet indicates they worked well and were accepted.

The regulations are relatively simple. Like the PGA Senior tour, there are two age groups: 45 to 55 and over 55 (must be an AMA member).

The models used must have been designed and flown before December 31, 1969. The original planform is mandatory. Retract gears aren't allowed. SPA provides a list of documented designs. Contestants must provide documentation proof for any design not on the list.

Dick Schwieren's "out of the mothballs" 30-year-old Live Wire Custom.

The engines used must also be of pre-1970 vintage. Schnuerle-ported types are illegal. Four-stroke engines are limited to .70ci displacement. Mufflers are required, but tuned pipes aren't allowed.

Modern radios are allowed, but they must conform to AMA "gold-sticker" regulations.

The list of "legal" aircraft is already lengthy, indicating there must be a multitude of fine designs to choose from. Just consider these randomly picked noteworthy designs: Kwik-Fli; Orion; Taurus; Beachcomber; Astro Hog and Sultan, for starters.

As far as the competition is concerned, it's divided into two categories—Novice and Super. Neither of the maneuver schedules should scare anyone who flies aerobatics. Both schedules appear to be from the '50s and '60s. If you can loop and roll, you'll find that to be the most complicated in the Novice list. The Super schedule includes some of the usual complex maneuvers, but none of the *wild stuff* seen in modern schedules. For most accomplished R/Cers, the routine seems to fit right into a normal weekend of flying.

We had a nice long letter from Mickey Walker with additional info about SPA happenings. A bottom line would be that they're swamped with interest, and SPA's time has come. He had hoped (of course) for a good response, but is still surprised by the many OTers checking in—so much so that a national clearing house became mandatory. A quick solution was for the North Georgia Flying Circus club to serve as headquarters and provide a means to organize. They've already chartered several clubs around the country as well as one in Canada. It's hoped that these clubs will feature competitions during the 1992 season.

Seen at the first Senior Pattern Association meet are Curtiss Motes with his New Orleanea and Jerry Rosser with his Kwik-Fli.

The headquarters club has decided to conduct the 1992 SPA Masters event on September 26 and 27 in Smyrna. That should get things started. For the future, the plan is to have the Masters as a true national event and perhaps even resolve it into a World Championship for Seniors.

Just wish I were 20 years younger!

You should see that there are now OTR/C organizations to suit everyone with an interest in the activity. If your desire runs toward *all* the types flown and little, if any, competition, the VR/CS could be for you. If you have fond memories of pattern flying as it used to be, the SPA awaits your presence. Then, of course, there's nothing wrong with joining both groups and enjoying the pinnacle of old-time R/C!

PLANS PLACE

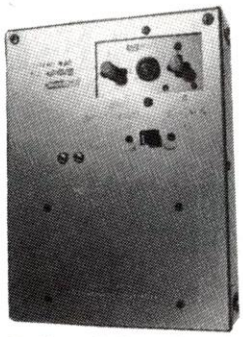
Another source of OTR/C plans has surfaced. Penn Valley Hobby, 837 W. Main St., Lansdale, PA 19446 offers an extensive inventory, including some not noted before. A random review spotted these choice designs: Bi-Fli; Charger; Astro Hog; Orion; Twin Viscount; Taurus; Beachcomber and the Stormers. Contact them for a complete list.

MAILBOX

We should get back to some of the interesting input discussed briefly in the last edition. Stan Vana of Oak Lawn, IL, provided a good clue to the mystery radio and photos of some of the reed equipment he worked with during the '50s. Photo 1 compares a modern receiver with four reed receivers. As well as the apparent disparity in size, there was also a considerable weight difference.

Not shown is the additional handicap created by the batteries required. Though the modern system operates reliably on one, small, 250mAh Ni-Cd, these reed systems required three separate packs, each at least twice the weight of the modern pack. There was an "A" or filament pack of at least four pen-cells, a 45V "B" pack for tube and relay power, plus another four pen-cells for servo power (all dry cells and heavy). Relating to the photo, the receiver on the upper right is a Vana home-built.

Photo 2 shows one of the 6-channel transmitters Stan and his dad built. It might be difficult to see the relatively small control sticks. In the upper right corner there's a power-indicator light between the very short control sticks. Each stick moved in four directions, as they do now, but each controlled four channels instead of two. This being a 6-channel transmitter, the inner stick was probably used for engine control and thus only controlled two channels.



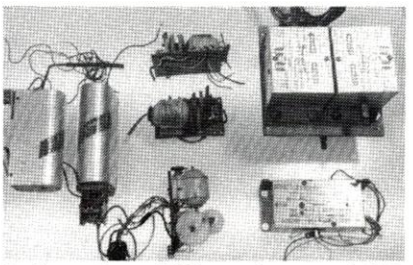
2. Vana 6-channel reed transmitter-power indicator light (top right). Unusually short control sticks on each side of light.

Photo 3 allows an excellent comparison of the reed-style servos available in the '50s. On the left is the infamous Babcock "mailbox" servo intended for use with their multi audio system. Like all the others, it required two channels for operation, so it was feasible to use it with reeds, although it was seldom seen. At top center are the MCR and MCE "Multi-Servos" by Dmeco. The MCR self-neutralized as did the MCE. The MCE, however, was "trimable" about neutral, so it offered an elevator trim feature as well as full control.

At bottom center is a rare Frank Schmidt servo. The original Schmidt servos used a "jackshaft" for gear reduction and output. When it was discovered that the jackshaft was subject to "locking up"with reverse air loads, Frank resorted to spur gears to alleviate the problem. Unfortunately, the change came too late for most of the Schmidt systems produced.

In the top right are two of the original Bonner servos. Note its large size and "boxy" shape and that its output was linear as was the Babcock's. The Multi-Servos and the Schmidt used the rotary output that we have today.

Lower right is the widely used Bonner Duramite, which was a smaller, lighter version of the original. Also linear, the output was on the side instead of at the ends as on the original. With the advent of "relay-less" reed systems, Howard Bonner managed to stuff an amplifier into this servo, and it then became the "Transmite."



3. Comparison of '50s reed servos. Left is Babcock Mailbox. Top center: two Multi-Servos. Bottom center: a rare Schmidt. Top right: two original Bonners. Lower right: the Bonner Duramite.

Know that you had to wire all these servos for your battery supply and receiver. None of the early systems came ready to plug in! Note that the servo-wiring diagram was printed on the Bonner servo covers.

We thank Stan Vana very much for the effort extended and for these photos.

I'll close with more input from Dick Schwieren of Burns, OR, who resurrected a 30-year-old LW Custom bipe. Dick tells us it flies really well with his O.S. Surpass .48 for power. As expected, he found the flaps suggested on the plans are of much value on this slow-flying R/C plane. He says that the performance of this OTer fits right in with all his modern R/Cs. It looks great, too!

Remember, this is your OTR/C place, do keep in touch!

**Here are the addresses that are pertinent to the article:*

Vintage Radio Control Society, *4326 Andes Dr., Fairfax, VA 22030.*

Senior Pattern Association, *3121 Northview Pl., Smyrna, GA 30080.* ■

LOW BUCK, EASY-BUILD A-10

Starting the engines is easy. The leads exit the nacelle from the rear and are out of the prop's way.

TANK BUSTER

PHOTOS BY JOHN KIDD

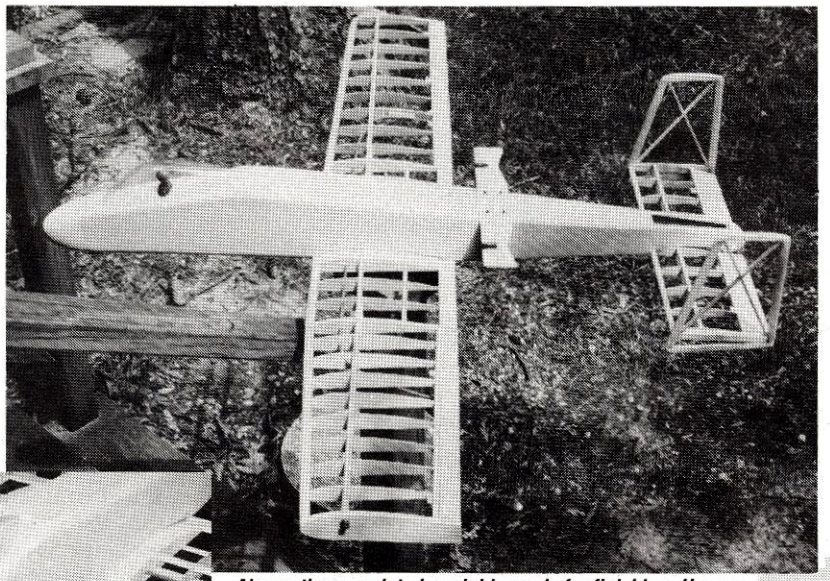
by JOHN KIDD

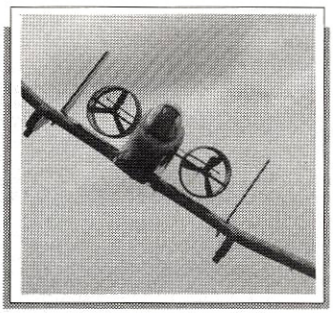
"WHAT IN THE world are you doing?" This time, she knew I had flipped. I had just awakened from a night's sleep and, still lying in bed, I was holding my hands up to form a small circle.

According to my ever-patient and understanding wife, I had been saying "That's it" all night in my sleep. And that's how it all began.

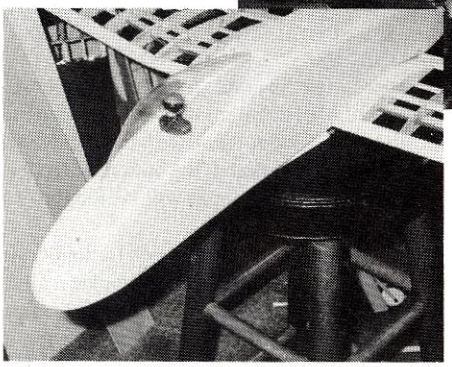
That night, I had dreamed of building and flying an R/C A-10. Now, maybe I had been watching too much CNN (at the time, the Gulf War was cranking up); or maybe I had watched too many "Wings" episodes; or maybe my wife was right: I really *had* flipped! At any rate, the dream seemed real; and besides, having an R/C A-10 would be great. And when I began to give it some thought, it almost seemed workable.

(Continued on page 71)



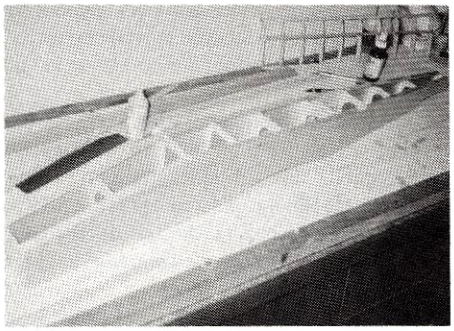


A-10



With a canopy and a nose block in place, the fuselage definitely has that "tank-buster" look.

Above: the completed model is ready for finishing. Use an iron-on covering to save weight. Below: the nearly completed fuselage—needs only nose and tail blocks and top and bottom sheeting.

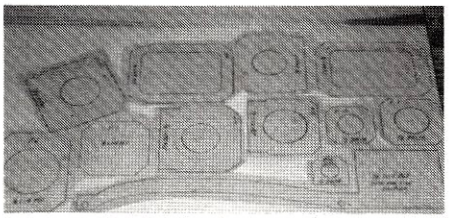


SPECIFICATIONS
Type: Sport scale
Wingspan: 56 inches
Length: 45 inches
Weight: 40 to 48 ounces
Wing area: 459 square inches
Wing loading: 13.8 ounces per square foot
Power req'd: Two Cox TeeDee .049 or .051 1/2A engines
Fuel capacity: 2 ounce (single tank)
No. of channels: 2 (aileron, elevator)

Features: take your flying field by storm with this 1/2A A-10 twin that uses enclosed, "ducted fan"-like propulsion units. Featuring a box fuselage and simple, built-up wings, this model of the A-10 Warthog is extremely affordable, easy to construct and easy to fly. Power is provided by two Cox TeeDee engines (housed in two-liter soda bottles) turning 5x3 propellers that have been cut down to 4 inches in diameter. Unlike many twins, this model will fly stably with one engine out. The interchangeable power pod is bolted to the fuselage (larger engines can be mounted for still hotter performance). A generic 9-inch WW II-style canopy is used to cover the pilot, and olive-drab MonoKote makes it look authentic.

This being my first attempt at designing and scratch-building, I knew I really had an education ahead of me. First, I had to gather as much information about the Fairchild A-10 (Warthog) Thunderbolt II as I could. A trip over to New Orleans to some of the bigger hobby shops seemed in order.

After picking out the appropriate Squadron/Signal publication, plastic models and some other information, I asked about the feasibility



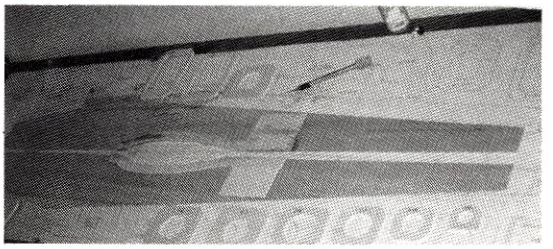
To save material (and reduce waste), first lay out all the parts templates on the wood.

of such a project. With a quick glance, "Sounds ambitious" was all the man said! Talk about lack of enthusiasm! The mission was obvious: this plane had to be built! And even when the prototype was being built, the low snickers from the "experts" showed their disbelief. Nevertheless, the plane was built and won fourth place in the *Model Airplane News* 2nd Annual Design Contest. So there! The moral of the story? No matter how many unenthusiastic, disbelieving "experts" come your way, press on! Believe!

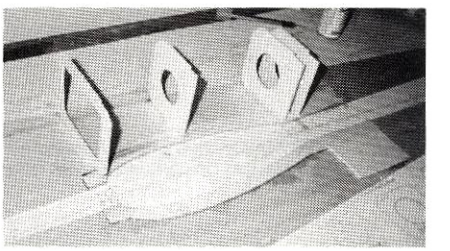
BUILDING THE A-10

One of the first obstacles was choosing the engines. I knew I wanted a small, light, simple model. The economics of building a full-blown, two-fan, twin-engine, snarling, fully loaded A-10 with retracts and flaps made it out of the question. We had just had a new addition to the family, and though my wife is patient and understanding, she isn't crazy. It became apparent that one of the Cox* TeeDee series would be the best choice for this application. For a small, light, inexpensive means of propulsion, the Cox TeeDee engines are hard to beat.

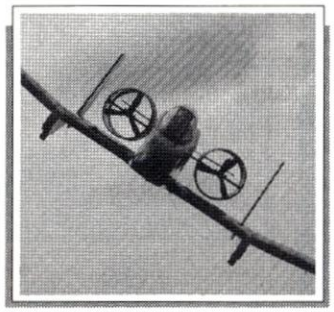
The next apparent problem was the construc-



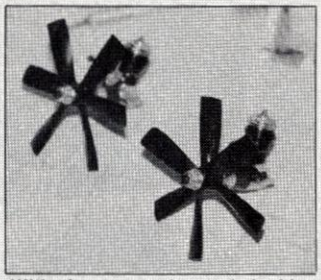
Left: the fuselage is simple box construction with sheet sides. Make a left side and a right side.



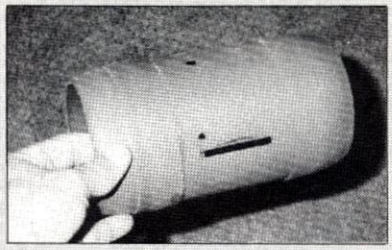
Right: a lite-ply doubler at the wing saddle increases strength. Make sure you install the formers square to the fuselage sides.



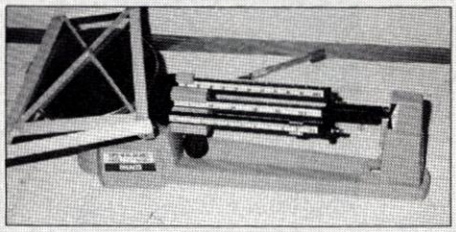
A-10



With these experimental double-prop setups, the model needed .09s for additional power. Standard .049 engines with 5x3 props work well.



The completed engine nacelle is made of plastic soda bottle parts that have been glued together with Zap-a-Dap-a-Goo.



It's very important to keep weight down aft of the CG. Select your wood carefully.

tion of the "jet" housings. At first, I experimented with large beer cans. These proved to be heavier than I had imagined and, after a few tests, they were dented and worn. I tried rolling my own balsa, but it was too fragile. I needed something more flexible and durable. Have you ever noticed that if you turn a two-liter soda bottle on its side, it looks like a "jet" engine housing? Was that the answer? With a little reinforcement, I thought it might work. And besides, if it wears out, the supply of replacements is almost endless. After these problems had been worked out, I really got serious.

The A-10 is extremely easy to build. Its fuselage is a "box" construction with an angle here and there. The wing is built in three parts using a typical balsa construction.

Before you start, there are a few things to consider. Use the lightest balsa possible. I took the time to weigh two "identical" pieces of balsa. One piece was lighter in color, had less grain and weighed 35 grams; another was darker, had more grain and weighed 72 grams! It's imperative that you use light balsa—especially on the fuselage sides and wing ribs. The target weight, with engines and radio installed, is 2 1/2 pounds. The lighter, the better. Now, let's get specific....

THE WING

The wing is built in three segments, and you start with the center one. Begin by laying down the 1/4-inch-square spruce spar and the 1/4x1/8-inch balsa brace. Cut out and position the bottom sheeting, and glue it to the spars. (The entire aircraft is constructed using CA glue.) Position the trailing edge, and glue it to the bottom sheeting. When making your center wing ribs, use the "stack-and-cut" method; the R-1s are slightly smaller to accommodate the 1/16-inch balsa sheeting, but the others are all the same.

Determine where your flexible pushrods will go, and drill the hole for them while the ribs are stacked. This will save you a lot of time later. Put the ribs into place and glue them. Glue the leading-edge balsa to the outside ribs. Glue the front of each rib to the leading edge, making sure they're correctly aligned.

Now position and glue the top spruce spar, and then glue in the spruce servo rails for your aileron servo. Position the 1/16-inch-thick balsa vertical webbing and glue it into place, then glue the top sheeting into place. Cut out and glue in the 1/8-inch-thick balsa gussets. That's it for now.

Let's move on to the outer panels, which are built much like the center section, but there's no sheeting. Pin the bottom 1/4-inch-square spruce spar into place. Position the 1/4x1/2-inch balsa trailing-edge spar in the proper place. You'll notice that the outer wing ribs are of different sizes, so cut them out two at a time, stacking two pieces of balsa (one cut will produce ribs for both outer wing panels).

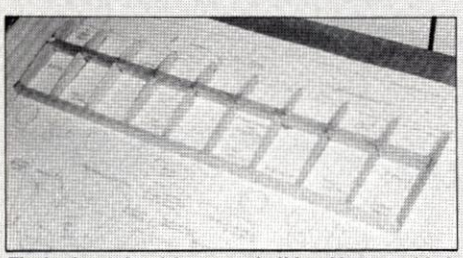
Drill holes for the flexible pushrod. Position the appropriate ribs, and glue them to the spruce spar and the balsa trailing-edge spar. Be sure to position R-3 so that the outer panel will show 10 degrees of dihedral. If the bottom of R-12 is raised 3 inches, the angle will be roughly 10 degrees.

Next, glue the small piece of trailing-edge stock into place, as shown on the plans. Glue the top spruce spar into place. Glue the leading edge to the outer ribs. Notice that on all sections of the wing, the outer ribs are made out of 1/8-inch balsa instead of the 1/16-inch balsa you used for the inner ribs. Properly align the leading-edge balsa with the ribs and glue it into place. Cut out the balsa aileron and attach it with your favorite hinge. Don't *glue* the hinges at this time. (They'll be glued into place after the wing has been covered.)

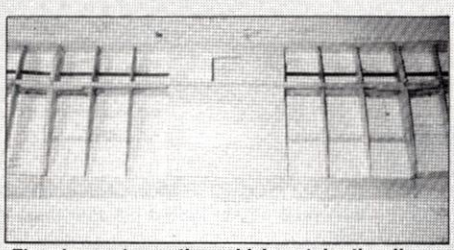
The wing tips are extremely simple. Position a piece of 1-inch balsa trailing-edge stock on the end of the R-12 so that the thicker part faces downward. Glue it into place and sand it to shape. Let the piece of trailing-edge stock extend to the back of the aileron.

Cut the wing-tip plate out of 3/32-inch sheet balsa, but don't glue it to the end of the wing panel at this time. It's easier to do this after the wing and tip have been covered. Be sure to install 1/16-inch balsa vertical webbing, and glue 1/8-inch sheet-balsa gussets into the four corners.

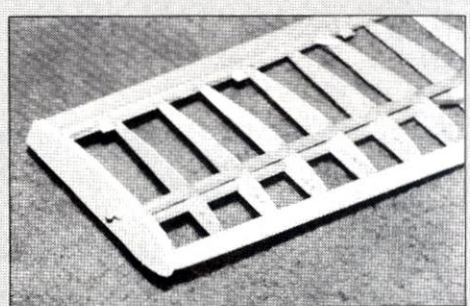
To join the wing sections, first put the center section on a flat surface. Next, cut out the 1/8-



The horizontal stab is easy to build and is assembled over the plans. Elevators are connected with wire.



The wing center section, which contains the aileron servo, has been sheeted. Note that the ribs at the dihedral joints are made of 1/8-inch-thick sheet balsa while the rest are 1/16inch thick.



The wing tip is made up of trailing-edge stock with the thick part facing downward and a balsa tip plate added.

A-10 MATERIALS

- 3—1/4x1/2x36 balsa
- 1/4x1/4x36 balsa
- 2—1/2x3/4x36 balsa
- 2—1/8x1/4x36 balsa
- 1/4x3/8x36 balsa
- 1/4x1x36 balsa aileron stock
- 3/8x1 1/2x36 balsa aileron stock
- 1" trailing edge balsa (36")
- 3—1/2x36 triangle balsa
- 2—1/4x36 triangle stock
- 6—1/16x3x36 balsa sheet
- 1/8x3x36 balsa sheet
- 1/4x3x36 balsa sheet
- 2—3/32x3x48 balsa sheet
- 3/32x3x36 balsa sheet
- 3—1/4x1/4x36 spruce
- 2—1/8x12x24 lite-ply
- 1/32x6x12 plywood
- 1/4x36 wood dowel
- Sig 9" WW II canopy (no.WC-809)
- Split elevator control horn
- Williams Bros. jet pilot (1" scale)
- 2—1 3/4" Dave Brown Lectra Lite form wheels
- 3x3x12" balsa block
- Sullivan SS-2 (2 oz.) fuel tank
- 2 Cox TeeDee .051 engines
- 2 Cox 5x3 3-blade props. (Cut down to 4")
- 2 Cox prop spinners and screws
- 4—2-liter soda bottles (with plastic base)
- 2 rolls MonoKote
- 2 Sullivan flexible pushrods
- Sullivan semi-flexible pushrod
- 2—1 1/2A control horns
- 10 small hinges
- 4—4-40x3/4 socket head bolts, washers and blind nuts
- 8—2-56 x 3/4 socket head bolts, washers and blind nuts
- Formula-U spray paint (to match MonoKote)
- 1 foot 1/2A fuel tubing
- 4 small wood screws (1/2")
- Bottle of CA
- Tube of Zap-a-Dap-a-Goo glue

inch-thick plywood dihedral braces. Under no circumstances should you use lite-ply for this. Granted, it might work, but don't take the chance. Regular 1/8-inch plywood will add very little weight and is much stronger.

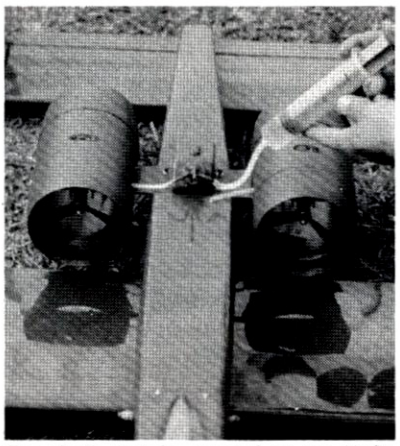
Now that the center section is in place, position one of the outer wing panels so that there are 3 inches of clearance under R-12, between it and the workbench. Sand and glue together both W-3 ribs from the inner and outer panel. Glue the dihedral braces into place. (This isn't the place to be light with the glue. Be sure the bond is tight.) Attach the other panel in the same way. After the wing has been constructed, sand the leading and trailing edges to shape.

After the wing has been sanded, install the aileron servo. Go ahead and fit the inner pushrods and control horns. Remove the servo and cover the wing and wingtips with your favorite iron-on covering. Most of the A-10s that fly over my area are in olive-drab camo. I covered the model with regular olive-drab Coverite's* MonoKote. Take your pick. After you've finished the covering, glue the wingtips into place. Now install the servo, the pushrods and the control horns.

THE STAB

The horizontal stab uses 1/4-inch-square hard-balsa spars. Start by laying the bottom spar and trailing edge into place. Once again, the ribs are identical, so stack and cut. Glue the ribs to the bottom spar and trailing edge, and glue the top spar into position. Attach the leading-edge stock to both 1/8-inch-thick balsa outer ribs. Align the assembly with the leading edge, and glue all the inner ribs to it.

The elevator is the split type and uses a center-mounted control horn. Cut out and position the elevator halves, and fit the hinges and the control horn. Don't glue the hinges in yet. Sand the leading and trailing edges to shape. Go ahead and glue the control horn to the elevator halves; cover the the elevator and stab with MonoKote; and install the hinges.



The single tank is mounted on top of the fuselage for unrestricted access. No pressure is used.

VERTICAL FINS

The vertical fins are made out of 1/4x1/2-inch and 1/4x1/8-inch balsa sicks and built directly over the plan. Be sure that they're identical. Sand and round their edges, and then cover them with MonoKote. Easy enough!

WHEEL WELLS

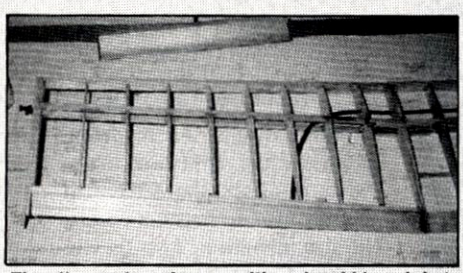
The wheel wells are built to resemble the appearance of an airborne A-10 with the wheel retracted. Both are made of a 5/8-inch-thick balsa core covered by 1/32-inch-thick ply outer skins.

Fit the wheel and axle inside the well. Now, using 1/32-inch ply, make two axle holders, which are nothing more than small squares of ply with a central hole that fits the axle. Place the wheel, axle and axle holders inside the wheel well. When they've been positioned properly, glue the axle holders into place inside the 1/32-inch ply outer skins. Don't hesitate; it's easier than it sounds. Once the wheels have been installed, cover the entire assembly in the appropriate color. After covering them, glue both wheel wells to the wing. They were designed to relieve some of the wear and tear of repeated belly landings.

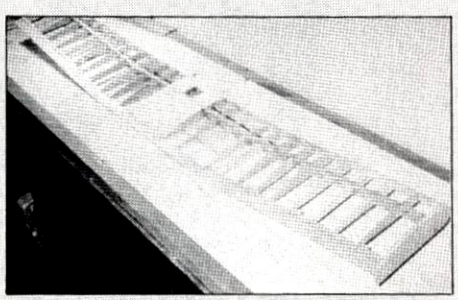
FUSELAGE

The fuselage is typical box construction using balsa and lite-ply. Start by laying out both 3/32x4x48 fuselage sides. Cut the pieces to the plan outline. You'll notice that you'll have to add a small triangular piece of 3/32-inch balsa

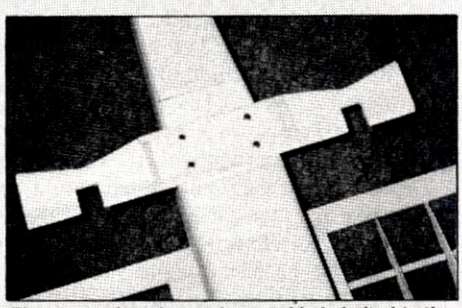
(Continued on page 103)



The ailerons have been positioned and hinged, but they shouldn't be glued in until the wing has been covered.



The completed wing is ready to cover. The wing-tip plates will be attached after the wing has been covered.



The plywood engine-pod assembly is bolted to the fuselage top. Blind nuts are installed in a plywood plate on top of the fuselage.

FLOATING AROUND

JOHN SULLIVAN

'91 SCHNEIDER CUP... GOOD TIMES, BAD TIMES

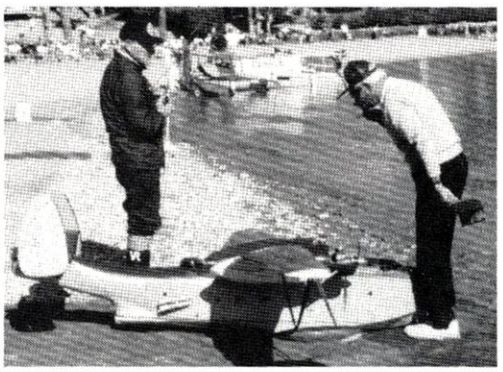
Don Panek's Bernard HV-220 comes in fast during the speed trials. Don drove all the way from Bakersfield to capture 7th place at this year's event.

WELL, FAITHFUL readers, I have good news, and I have bad news. The good news is that, despite tremendous obstacles, Bob Martin and the Havasu Desert Hawks pulled off another fine Schneider Cup Re-Creation—their third. Roy Slater, who has attended every year, finally took top honors with his 1914 Sopwith Tabloid. He squeezed past Bill Curry's 1931 Bernard HV-220 by $^1/_{10}$ of a point. Dick Skogland flew a 1913 Duperdussin to 3rd, J. Paul Lussier took 4th with another Tabloid and Richard Pasqualetto placed 5th with his 1931 Macchi MC-72.

There were plenty of good times. The Desert Hawks raffled off a ride in a beautifully restored 1936 Tiger Moth piloted by Bob Curtain of Scottsdale, AZ. Ken Lage of Phoenix won the ride and proclaimed it one of the highlights of his life. To everyone's delight, one of Curtain's friends brought a Sea Bee in for a couple of landings and takeoffs. Several antique cars—including a '31 Ford Victoria, a '34 Rolls-Royce and a '25 Ford beer truck—were displayed, and the Hawks also staged a period costume contest.

Martin speculates that many people didn't participate in the costume event, because they feared that they'd look silly. As it turned out, though, those who dressed up were the hit of the event. Slater and his wife Dolores and Ian and Carol McInnes even wore their costumes during the competition. After seeing everything from Ian's authentic flight suit, which was worn by 1914 Tabloid pilot Howard Pixton, to Roy's period bathing suit, the judges were tied. Although they asked the crowd to decide, the contestants agreed to a tie and donated the prize money back to the Schneider Cup Association.

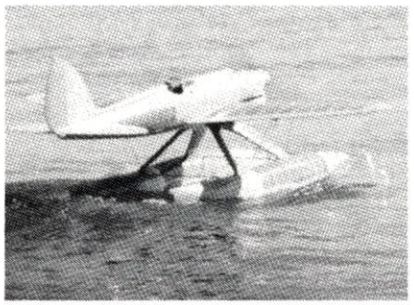
Quite a few manufacturers set up booths, and they offered everything from electronics to sunglasses. Add to all of this an excellent banquet on Saturday night and between-race demonstrations of a $^1/_2$-scale (yes, *one-half*) Sopwith Tabloid by Lussier and a PBM Martin Mariner complete with JAYTO assist by John Nicolaci, and you have the makings of a first-class seaplane event.



John Nicolaci brought his PBM Martin Mariner from way back east for a demo flight. Next year, the Schneider Cup will also feature a giant-scale float fly.

The weather was cooperative. Friday started dead calm, but by 10:30 a.m., there was a breeze that increased all day until the Hawks had to postpone the final speed trials until the next morning. On Saturday morning, the weather was perfect; the wind remained calm all day and temperatures were in the low 80s. On Sunday, however, the wind returned and only the skills of the pilots allowed a final round to be flown.

That was the good news. The bad news is that the event's organizers were faced with unfortunate circumstances that affected turnout. In addition, many of this year's Schneider racers made their final plunge before the race even began.



Bill Curry's HV-220 taxies out during Friday's speed trials. Curry took 2nd place with this sister ship to Panek's Bernard.

The event's difficulties began with the recession, which forced many entrants to cancel because of financial difficulties. In addition, the Scale Masters (which was held just a few hours drive away) *and* the RCHTA show had been rescheduled, and they took place during the Schneider Cup. This drew contestants, spectators and manufacturers away from Havasu. Martin stated that this situation was entirely avoidable. It was unfortunate that many people were forced to choose from among the three events. As modeling grows and the number of major events increases, the AMA will not only have to sanction events, but also administer how they're scheduled—at least on a regional level—to avoid conflicts. You

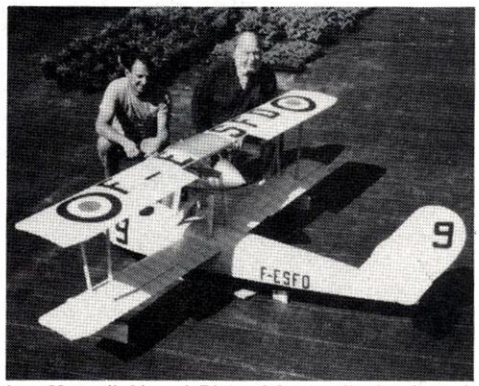
J. Paul Lusier's 1/2-scale Sopwith Tabloid is so big that you can't even see the retrieval pontoon boat that's parked behind it. The Tabloid performed taxi demos at the '91 Schneider.

First-place finisher Roy Slater was all smiles at the awards ceremony. Three years of perseverance helped him to capture the trophy and $1,000.

can bet that the AMA Nats doesn't have to compete with anything.

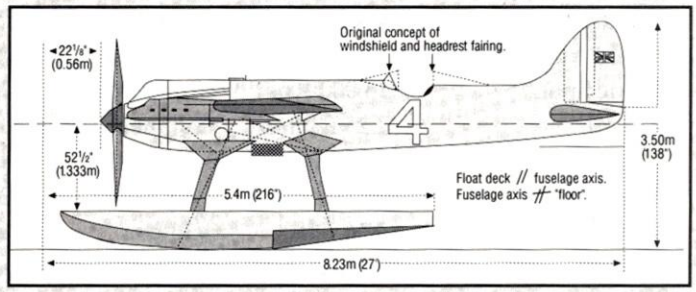
I can personally attest to one of the pre-race fatalities. The Savoia S.65 crashed one week before the Schneider Cup, and it was totally destroyed. Mike Johnson and I had spent the previous two months rebuilding the G62 engine—reworking the shaft couplers, the detailing, etc. Everything seemed fine, and for our first (and only) test flight, the Savoia lifted off with authority. Except for a little out-of-line tracking, which we knew could be corrected with more rudder mix, the first two flights around the lake were uneventful. During the third go-round, however, we saw something fall from the plane and flutter down to the water. By the time we figured out that it was one of the copper, simulated radiator strips, Mike was yelling, "I don't have it!" We just stood there, stunned, as the Savoia crashed into the water. An inspection revealed that two-thirds of the copper strips had peeled off, and the others were half off. Apparently, the adhesive we had used to apply them had dried out during the course of two years. The loose strips either destroyed lift or jammed an aileron, and it was all over.

Harlen Warwick and Jim Rasmussen lost a Curtiss R3C-2 and a Supermarine S6.B; both crashes were attributed to radio problems. Richard Lucas crashed his su-



Lan Mace (left) and Richard Lucas display Lucas's Cams 38. The Cams crashed before the Havasu race. Lucas reports it's repairable and will compete in '92.

THE S.4 STORY



The full-size 1925 Supermarine S.4. Sideview courtesy of Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, CA 92626.

In 1924, British aeronautical engineer Reginald Mitchell sat down to design a racer that would take the Schneider Cup in 1925. The resulting Supermarine S.4 was revolutionary for the period. Its fuselage was "skinned" with three cold-molded plywood sections. Inside, two steel-pipe A-frames formed the structural center, which incorporated the float struts, the "pass-through" housing for the cantilever wing and the mount for the Napier-Lion engine. There weren't any external bracing wires or protrusions whatsoever, making the S.4 a synthesis of aesthetics and aerodynamic "cleanliness."

Henri Biard, the pilot chosen to fly the S.4, was spooked by the plane. The cockpit was mounted aft, so visibility was poor, and Biard reported wing flutter that gave him the disturbing sensation of being followed by a "ghost" plane! Nevertheless, the sea trials continued, and on September 13, just weeks before the race, Biard flew a 3K course at 231.4mph, setting a new world seaplane speed record.

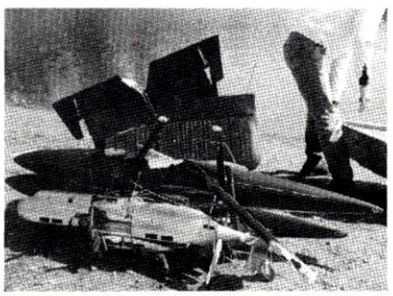
By October 23, the Brits had the S.4 on Chesapeake Bay ready to meet the Americans with their defending Curtiss. In a practice run before the trials, Biard again experienced the ghost effect. The S.4 rocked from side to side, sideslipped sharply and then "pancaked" into the bay, producing a tremendous plume of spray. Biard survived, and the Supermarine team wasn't deterred. Successive Supermarines won the Schneider Cup in 1927 and 1929 and then retired the trophy with a third win in 1931.

R/C City* will soon offer a kit of a Schneider-legal S.4. A few modelers got wind of the project and have already started buying parts. I've seen the glasswork on the fuse and floats, and the craftsmanship is flawless. R/C City is famous for its line of pattern planes, and you can bet there won't be any "ghosts" following this S.4.

Dick Skogland's 1913 Duperdussin heads for pylon no. 1 and a 3rd-place finish. That's Lake Havasu City in the background.

perb Cams 38 on Lake Mendocino in Northern California after his Sachs-Dolmar froze in flight. The Cams is repairable. Ralph and Phil Burton lost their Short Bristow Crusader on the rocks alongside the Colorado River after one of its engines failed. (Martin was on the sticks.) H.L. Skates withdrew his R3C-2 after his twin-engine Reno Unlimited racer crashed a few weeks earlier (he was a little nervous), and John Rapillo just couldn't achieve enough revs on the contra-rotating-prop Macchi MC-72 to get it airborne.

Have you had enough? Wait, there's more! Of the nine planes that finally made the starting gate at Havasu, only four could still fly after the final round! Don Panek and Curry entered identical Bernard HV-220s. Panek's crashed toward the end of the first heat, and Curry's went down in the sixth heat. The fuselage and wings from Curry's plane and the floats from Panek's survived so, between them, they figure they have one model. The carnage continued till the final flag, and "Murphy" had his day.



This is all that remains of the Sullivan/Johnson Savoia S.65. The twin props caught the flying wires on impact and wrapped the Savoia into a ball.

Havasu '91 is behind us like a 30-mile trail of broken balsa and torn MonoKote and I, for one, am grateful! In the aftermath, Martin suggested that the Schneider Cup be held every other year. His suggestion was met with a deafening protest: "Not on your life, Bob!" So, here's the scoop: the fourth annual Schneider Cup Re-Creation will be held in November '92 on Lake Havasu with (and this is a new wrinkle) a giant-scale float fly. Watch this column for more details.

I want to thank Martin for his excellent report on the event in the "Schneider Cup News,"* and Frank Kelly for his computer print-out of the race results. I borrowed freely from their material to prepare this report. Thanks also to Curry, Fred Constantine and Richard Lucas for providing this month's photos.

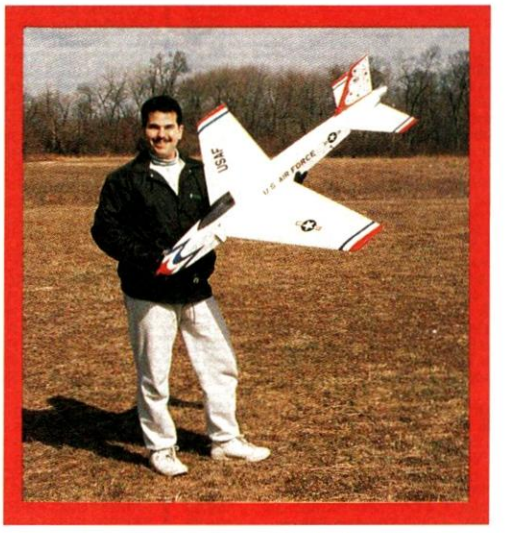
**Here are the addresses that are pertinent to this article:*
"Schneider Cup News," *1520-B Corona Dr., Lake Havasu City, AZ 86403. Annual subscriptions: $5.*
R/C City, *96 Railroad Ave. #F, Suisun City, CA 94585.* ■

MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW

Vapor-trail performance

Great Planes

PATRIOT



by TIM DIPERI

ONLY A FEW weeks before I had the opportunity to review the Great Planes* Patriot, a couple of my friends encouraged me to be the third person on their demo team. I couldn't think of a sharper-looking airplane to use for this team than the Patriot.

The Patriot comes in a standard (small) box that's full of balsa, most of which is extremely light and of good quality. Almost all of the parts are die-cut balsa. The kit also includes basic landing gear, a canopy, a small package of hardware, a full-size plan set (two sheets) and a well-written (if occasionally confusing) manual with many good black-and-white photos.

CONSTRUCTION

The horizontal stabilizer is a built-up structure that's sheeted with thin balsa. This makes for a strong, light empennage. The vertical fin is made of many pieces of 1/4-inch-thick light balsa. The fuselage is made of two main sides around several bulkheads. The firewall is attached to the fuselage sides with epoxy and reinforced by three small dowels on each side.

FLIGHT PERFORMANCE

The first day out, I met my good friend (and photographer extraordinaire) Ron Farkas. It was windy, but the sky was clear, so we gave it a shot. Overall, I rate the performance of this airplane as a "9" on a scale of 1 to 10 (for its class). I've never flown an airplane that I would rate a "10."

- **Takeoff and landing**

I experimented with crosswind takeoffs and landings. During takeoffs straight into the wind or with no wind, the Patriot tracks very straight and rotates in about 70 feet (on rough terrain). Only a touch (1/8) of right rudder is necessary during the climb-out. From my small, rough flying field, I executed the takeoff runs with full up-elevator and full throttle (to get the pressure off the nose gear). When the airplane broke ground, I reduced the amount of up-elevator and remained within ground effect for a moment or two (ground effect is usually no higher than the length of one wing panel) and then began the climb-out. The airplane has no problems on grass fields. In calm or straight-on wind, the Patriot is remarkably docile during landings. I've even performed a couple of dead-stick landings; you can slow this plane down substantially before it gets ugly. During a high approach, I tried a slight-forward slip to lose altitude during a final. I was pleasantly surprised that I didn't "run out" of rudder control as I have in the past while flying full-size aircraft. Nose-high, full-stall landings are predictable and consistent.

I tested this plane in a formidable crosswind. We received a report from the local Automatic Terminal Information Service of winds of 18 knots and gusts of 26 knots. The wind blew 70 degrees from my takeoff direction. Full right aileron during the takeoff roll, easing back close to neutral before liftoff, allowed the airplane to take off straight. Keeping the left wing down (toward the crosswind) during the landing kept the airplane tracking well down the runway.

During one landing, after the airplane touched the ground, I didn't immediately hold the left wing down with ailerons. Well, I got "bit"! The wind picked up the wing, and the airplane cartwheeled rather violently; the tail was really whacked hard. I have to say, I was extremely impressed that only a prop sustained any damage!

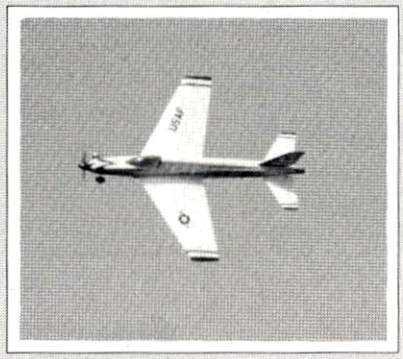
- **High-speed performance**

There's no question about it: the modeler who chooses this airplane wants to go fast! Fortunately, the Patriot does that very well. My K&B .61 engine has a very rich needle-valve setting. During these tests, I used both 15-percent-nitro and 30-percent-nitro special heli fuel. The engine ran very well on both fuels. The 30-percent-nitro fuel was noticeably more powerful, and the high oil content produces quite attractive smoke trails. I was very happy with the power and smoothness of the engine using this fuel.

During straight-and-level full-throttle flight, the airplane is like an arrow, i.e., it tracks as long as you shoot straight. There was absolutely no indication of control-surface flutter at all, and no trim changes were required.

- **Low-speed performance**

The Patriot's slow-flight characteristics are very good. After my first few flights, no one asked me how well it performed. I heard questions like, "Did you have to land it hot?" and, "I bet it stalls



easily." I had these thoughts, too, until I tested the plane.

When the Patriot is slowed to a stall, it tends to lower its nose but not drop a wing. Clearly, this has a lot to do with the built-in washout at the wing tips. More than once, I slowed the airplane to see if it would "wing wobble" before it stalled. The airplane just lowered its nose and continued. Nose-high slow flight is possible and predictable. The Patriot displayed absolutely no unusual low-speed problems at all.

- **Aerobatics**

I was very impressed that only a touch (1/16) of down-elevator was needed. I've never flown a .40-size airplane that did inverted circles so effortlessly. Even high-banked inverted turns—greater than 60 degrees—are a piece of cake. I never felt that there was marginal down-elevator control. I attempted some accelerated (high-speed) stalls. Even at a nose-high turn (about 50 degrees), using full up-elevator, I couldn't make the airplane stall. This was true inverted as well as upright. The Patriot performs large, round loops very well, but it requires some rudder correction to have the loop track straight.

If there were a class of maneuvers that the Patriot was made for, it would be rolling. On a straight-and-level pass, without raising the nose, if the airplane rolled with no down-elevator compensation, it didn't lose more than 2 or 3 feet in altitude. I estimate that the airplane has a 350- to 400-degree-per-second roll rate. During slow rolls (3 to 4 seconds), the Patriot only required about 1/8 rudder throw to hold the knife-edge position and even less down-elevator during the inverted portion.

Four-point rolls are a dream with the Patriot. From level to knife-edge, the airplane locks into position with absolutely no "over-travel" of the roll. About 1/8 to 1/4 rudder will hold the knife-edge with ease. In fact, the airplane will definitely climb positively during knife-edge flight. It may be partially owing to high power, but I'm sure that the large profile surface area on the fuselage helped significantly.

The airplane didn't snap-roll very violently. It also didn't flat-spin. The inherent stability of the Patriot is an asset unless violent snap rolls and flat spins are your thing.

PATRIOT

The instructions tell you to mount the fuel tank in place permanently. This wasn't acceptable to me. Call me old-fashioned, but I like to inspect the fuel tank regularly, so I made the bottom balsa block into a hatch.

After I had measured the engine compartment, I realized that, with a little carving, I could actually fit a K&B* .61 into it. It's a fairly light engine, so there was very little weight required in the tail for balance.

Editor's Note

Although the K&B .61 provides the approximate performance of a modern, high-performance, Schnuerle-ported ABC .46, the K&B is a classic, loop-scavenge design that's heavier than a modern .46, and its installation requires modification of the Patriot's engine mount. The author's choice of engine isn't a recommendation that readers install a .60, old or new. The manufacturer designed the plane for a high-performance .40 or .46 and recommends such an engine for best performance.

The fuselage construction becomes difficult when you have to wrap the top turtle decking around the top bulkheads. You have to soak the wood to make it flexible enough to wrap without cracking. Also, when the decking meets the tail, the construction is a little complicated. The decking is supposed to gradually blend into the tail, but the construction design doesn't lend itself very well to this. Glue a 1/4-inch block to the very top of the deck structure, and then sand it to meet the sides. The simulated air ducts are attractive features of this airplane. Although the ducts increase drag, they look good, and it doesn't take much time to make them. Unfortunately, they're very fragile, and you must be careful if you use them to handle the model.

Finally, I installed the three Futaba* 148 servos in the fuselage. I use a 7 UHP radio. Although this radio is made for use with helicopters, its computer allows me to disable any features that aren't necessary for airplanes.

PATRIOT

SPECIFICATIONS

Model name: Patriot
Manufacturer: Great Planes
Type: Sport/pattern
Price: $119.95
Wingspan: 47 inches
Wing area: 524 square inches
Wing loading: 17 ounces/square foot
Weight: 5 pounds, 7 ounces
Length: 56 inches
No. of channels req'd: 4 (throttle, aileron, elevator, rudder)
Radio used: Futaba 7-channel PCM
Power req'd: .40 to .46 ABC
Engine used: K&B .6 substituted as equivalent, but not recommended (see Editor's note in text)
Airfoil type: Fully symmetrical
Washout: Yes
Wing construction: Swept; built-up; wood
Kit construction: Wood

Hits

- Top-performing, high-speed aerobat
- Light , but strong, for high-stress flight
- Radio-gear placement in rear
- Construction allows easy installation of retracts
- Great lines

Misses

- Small die-cut parts should have been bagged
- Top decking is difficult to build

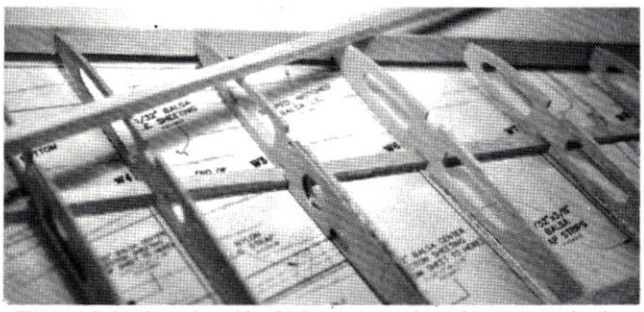
Here's the kit out of box. All wooden pieces of similar sizes are bundled with rubber bands. There are also several sealed poly bags that contain small wooden parts and hardware.

A unique feature of the airplane is that there are no external control horns or linkages; they're all internal. Primarily because the radio compartment is in the rear of the aircraft, none of the rigid steel-wire control-surface pushrods exceed 8 inches.

I definitely consider having the servos close to the control surface a big advantage. It's important that you take care of all linkages and glue the rear control-surface hinges when you mount the vertical and horizontal fins. If they aren't correct then, it will be very difficult, if not impossible, to fix them later.

PHOTOS BY RON FARKAS

The swept-back wing is built directly over the plans.



The spar is laminated, and its thickness tapers from the center to the tip.

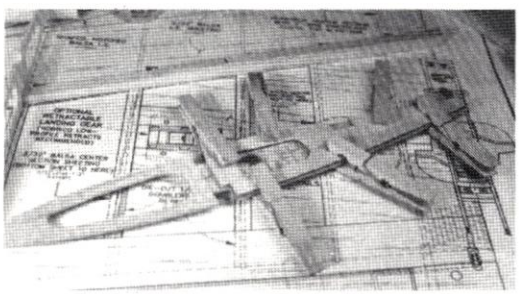
THE WING

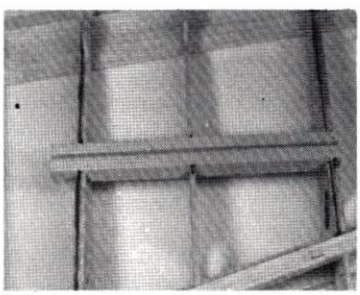
The Patriot has a swept-back wing with more wing area than it appears. It's approximately 2 inches thick at the center and approximately 1/2 inch thick at the tip.

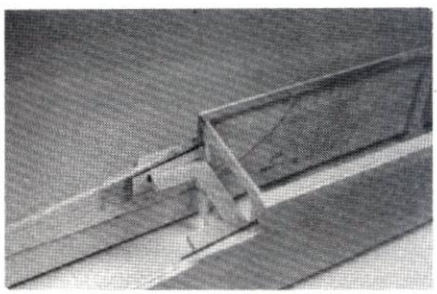
The built-up wing is partially sheeted. The spars are made of three pieces of balsa laminated to taper down in thickness. This, along with webbing between ribs, creates a strong, rigid wing.

Each rib has an extra tab at the bottom trailing edge that gradually changes in size. These tabs effectively create washout during the building process and are removed before you sheet the trailing edge.

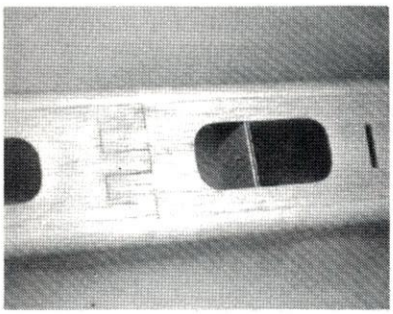
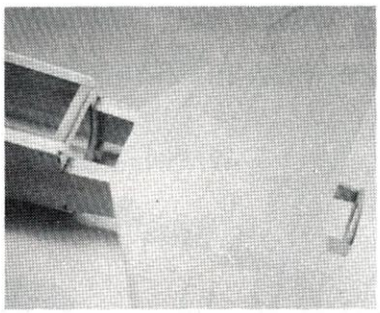
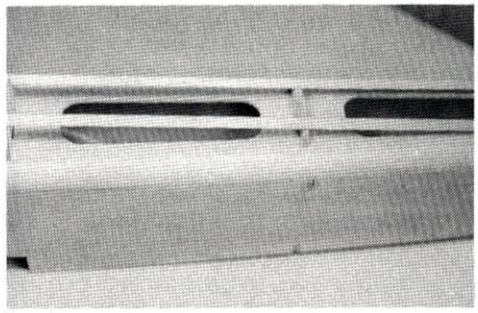
One of the wing design features that I didn't like was the absence of joining spars. I don't believe that the center section is as strong as it would be if a spar were used. The manual empha-



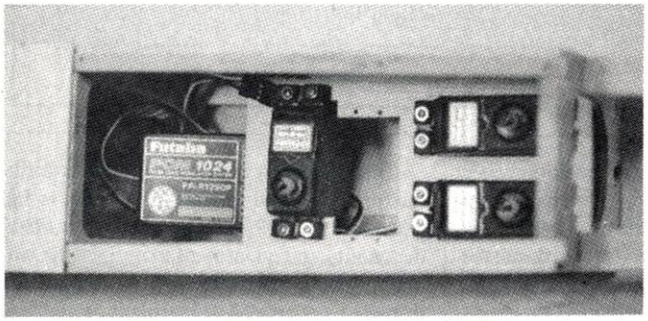




■ *Left: plywood rib doublers are used to reinforce the landing-gear blocks. The plans show you how to install the optional retractable landing gear—nice feature.* ■ *Middle: the wing panel. Note that the landing-gear block has been installed. The rib extensions on the tracking edge area provide washout.* ■*Right: the wing hold-down plate. Notice the balsa doublers on the inside of the fuselage.*

■ *Left: top of fuselage before turtle deck has been applied. The fuselage has been laminated in the center and has cut-out areas for strength and lightness.* ■ *Middle: the simple wooden stab is strong and simplifies construction.* ■ *Right: these stringers shape and strengthen the turtle-deck structure.*



Install the radio in rear of aircraft. It's a tight fit with all the equipment.

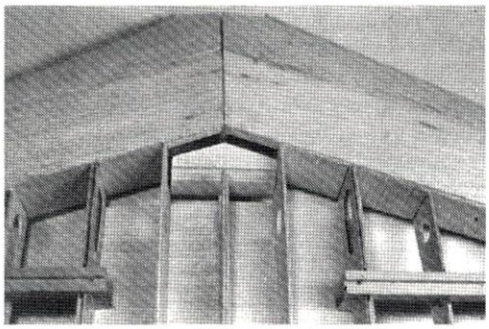
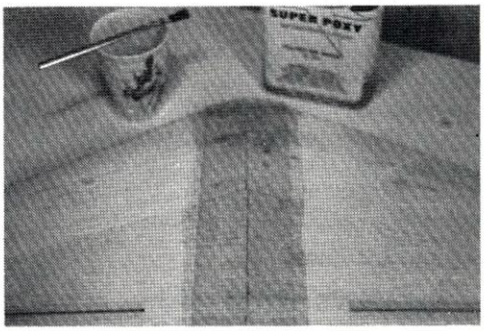
Finally, I applied the factory-supplied decals. At that point, I stood in a pile of sanding dust and realized that all of the effort had been worth it. The airplane looks hot. Its "jet-like" lines make it look fast while it's just sitting in my living room.

If I were to build this plane again, I'd probably do a few things differently: I'd paint the fuselage, because applying MonoKote to those compound curves was tough. I'd use retracts, because they're really easy to install on this plane, and the instructions walk you through it. I'd also use a high-performance .45 to .50 engine for better fuel efficiency.

If you've ever wanted to fly a jet, but didn't have the patience or the money to build one, the Patriot may be for you!

sizes that the center section *must* be fiberglassed. I did so with K&B polyester resin and the glass cloth that was included in the kit.

The ailerons were connected using the supplied pushrods. The only change that I made in this area was to use ball links instead of clevises. I've found that they're very reliable and they work well.

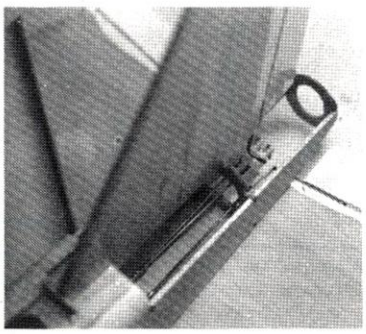
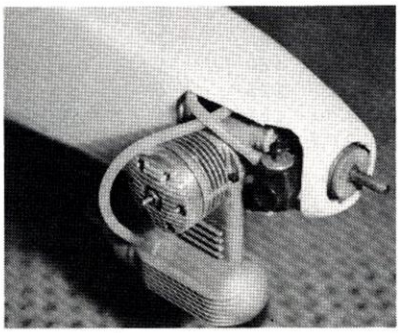
■ *Left: wing joined with center brace installed.* ■ *Right: it's important that you cover at least 4 inches across the center section with fiberglass.*

FINISHING

First of all, there's a lot of sanding and shaping to do to the blocks on the bottom center of the wing and near the rear of the airplane. I probably spent four hours just doing that! I finished this plane with MonoKote* for two reasons: I wanted to keep the airplane light, and I thought it would be easier to do than it was!

There are more compound curves than meets the eye on this airplane. There were several areas in which I used several pieces of MonoKote to accommodate the curve. Also, owing to the lightness and softness of the wood, it's easily dented with a sealing iron.

After I had scuffed the MonoKote with steel wool, I painted the trim with K&B glossy epoxy. The paint worked well and seems to hold up better than polyurethane.

■ *Left: inner works of the rudder and elevators. No linkages are visible outside the aircraft. Notice that the control surfaces are covered and mounted before the airplane has been covered.* ■ *Right: the K&B .61 fits snugly into the airplane; I only had to modify the engine mount.*

**Here are the addresses of the companies mentioned in this article:*
***Great Planes Model Distributors**, P.O. Box 9021, Champaign, IL 61826.*
***K&B Mfg. Co.**, 2100 College Dr., Lake Havasu City, AZ 86403.*
***Futaba Corp. of America**, 4 Studebaker, Irvine, CA 92718.*
***MonoKote**; distributed by Great Planes Model Distributors.* ■

TAURUS

(Continued from page 60)

powerful YS. It also looks neat stretched along the bottom of the fuselage.

The YS 120 pumper is a super engine that has proven to be reliable during the 50 flights I've had so far with the Taurus. I used 10-percent-regular Sig* fuel that produces all the power I need. Throttle response is clean and positive—the best I've ever seen. The 16-ounce Sullivan* tank is hooked up with a filter and the YS pressure valve on the model's exterior. It's all very functional and a snap to service. To receive clamps that hold the Hatori pipe, two 1/4-inch plywood standoffs are recessed into the bottom of the thick balsa fuselage .

FINAL CHECK AND SETUPS

I set the CG at the forward position shown and found quickly that the rearward position was a lot more fun. Flaps were set for movement from 0 to 90 degrees, and control surfaces were set at the indicated levels. Don't be afraid to do so; the Taurus likes a lot of control movement. In effect, it's an inherently stable airplane that's "forced" into maneuvers and snaps by large control surfaces with up to 45 degrees of deflection on either side of neutral or center. By the way, the sizable surface motion doesn't, in any way, make the airplane twitchy.

The Taurus is a very attractive, rugged airplane that has superior flight qualities for anyone interested in aerobatics short of total pattern involvement. It has a full-scale sport-airplane appearance, and it's challenging enough to be interesting to assemble, yet easy enough for builders with some experience. Many hours are needed to complete it, but it's a relatively quick "build."

I'm completely enthralled with the results of this project. Even though the Taurus is fairly expensive at $309, it's a good buy, considering the quality and quantity of materials, the workmanship, the hardware and the overall flight results. I called it a sport plane with "hair"; perhaps I mean that Scorpio and Hobby Lobby have provided us with a sport plane with flair!

Taurus may not be everyone's cup of tea but, for active Sunday fliers who want to develop their piloting skills and impress others at the field, it's nearly perfect.

**Here are the addresses of the companies mentioned in this article:*
Hobby Lobby International, *5614 Franklin Pike Cir., Brentwood, TN 37027.*
Ace R/C Inc., *P.O. Box 511C Higginsville, MO 64037.*
Robart Mfg., *P.O. Box 1247, St. Charles, IL 60174.*
Coverite, *420 Babylon Rd., Horsham, PA 19044.*
Black Baron; *distributed by Coverite.*

(Continued on page 90)

Painting Heli Canopies PART II

by RICHARD MUISE

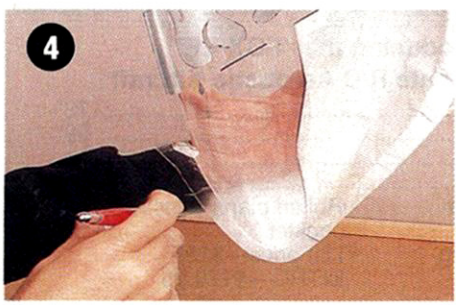
Color application secrets

Last time, I discussed how to cut, trim and mask the heli's canopy. Now it's time to spray on some color. (Refer to last month's issue to find out what materials you'll need.)

Using an airbrush or a spray can, apply candy blue to the non-flame portion of the canopy. Be sure to apply the paint sparingly for the first couple of coats. If you apply too much too quickly, it will run under the edges of the masking tape. If you use Pactra's candy blue in your airbrush, thin the paint with equal amounts of acrylic-lacquer thinner. If you aren't using Pactra paints, follow the thinning instructions that are supplied by the manufacturer. The only other paint that I'm aware of that will work for this type of application is automotive acrylic lacquer.*

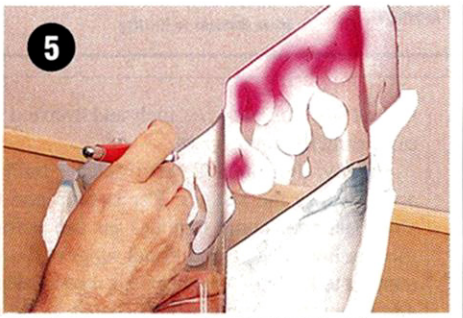
Using Pactra's candy-purple paint in your airbrush, shade along the edges of the tape. This gives you a shadow effect under the flames and makes them look three-dimensional.

After your candy colors have thoroughly dried, apply one or two silver undercoats. Remember: candy colors are transparent, and they have to be backed with either silver, gold, or white. Let this dry for at least an hour before proceeding. (This step can also be done with a spray can.) Next, remove the tape that's over the area to receive the flames. Do this slowly so that you don't pull up any of the freshly applied paint. You may have to cut carefully along the tape's edges to prevent this from happening.

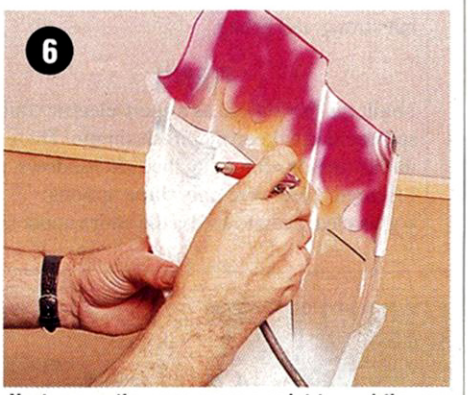


Thin the Pactra white paint (again, use equal amounts of paint and thinner), and spray the nose of the canopy halves. Be sure that you spray toward the front of the canopy so that you don't get overspray on the rear portion.

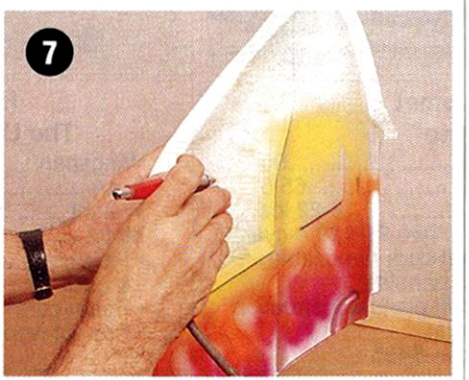
PHOTOS BY YAMIL SUED



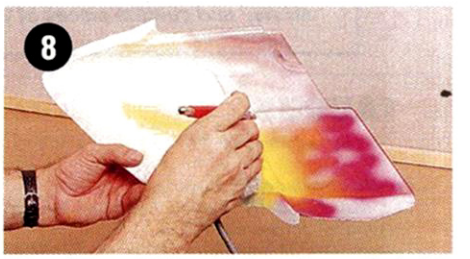
Thin the Pactra neon red as discussed, and spray just the tip of the flames with your airbrush. Again, remember to spray away from the unmasked area to prevent overspray problems.



Next, spray the neon orange paint toward the rear portion of flames, adjacent to the neon red.

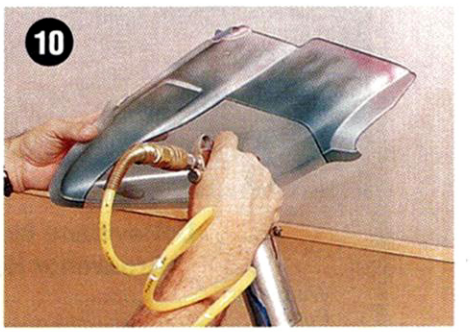


Thin some Pactra yellow, and spray in the last flame color in the area between the orange and the white. Be sure to wipe off any overspray with a tack rag, or it will show up later.



After all the paint has dried, apply a coat of white over the entire canopy. This will help intensify the neon and yellow colors, and it will also ensure that the tint for the windscreen won't bleed through the lighter colors.

Remove the masking tape from the windscreen area. Make sure that you don't lift off the black pinstripe border.



To tint the windscreen, use a mixture of two parts black acrylic lacquer, one part candy blue, three parts clear acrylic lacquer and eight to 10 parts acrylic-lacquer thinner. To achieve an even coating, apply this with a touch-up gun at about 40psi. This material will dry very quickly, so apply it in two or three quick, even coats. (Allow a couple of minutes between coats for it to dry.)

*Here's the address of the company mentioned in this article:
Pactra Inc., 620 Buckbee St., Rockford, IL 61104. ■*

TAURUS

(Continued from page 86)

Presto; *distributed by Coverite.*
YS; *distributed by Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.*
Tatone, *21658 Cloud Way, Hayward, CA 94545.*
Hatori; *distributed by Golden Gate Hobbies, P.O. Box 282005, San Francisco, CA 94128; (415) 342-5581.*
APC Props; *distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645.*
Sig Mfg. Co., *401 S. Front St., Montezuma, IA 50171.*
Sullivan Products, *P.O. Box 5166, Baltimore, MD 21224.* ■

PORTERFIELD

(Continued from page 56)

the center sheeting on the bottom of the wing just in front of the spar. The side view on the plans shows the slot about 1/16 inch in front of the spars. To make a stronger attachment, I moved the slot back 1/16 inch and epoxied the plate directly to the spars.

Finally, the rounded sheet tips are built up and glued to the last rib. The bottom and top sheet material come together on the airfoil's median line with no additional support. To add support to the 1/16-inch sheet, it's a good idea to add a few triangle-shaped ribs between the top and bottom sheet material.

The tail surfaces are very simple built-up stick structures, and they're the easiest part of the model to build. The design produces a light, but strong, tail group.

FINISH

I built the Porterfield as a sport-electric trainer, so I decided to keep the finish simple. There are no instructions for doing the side windows, and I figured there were only three options:

- glue clear acetate across the entire upper side, and paint the material leaving the window area clear;
- build additional window frames, and then glue the clear acetate into place;
- cover the fuselage sides, and apply window decal material for a simpler finish.

I covered the entire model in red MonoKote* and used silver trim sheets for the side windows. After making a paper windshield template (none is supplied in the kit), I cut the windshield and attached it to the fuselage with red trim tape. Then I primed the cowl and used Pactra's* Missile Red paint for the final coat.

The landing-gear wires are supposed to be covered with a piece of 1/32-inch plywood that's attached with silicone cement. I normally fly from a fairly rough field, so I opted to leave these off, as they'd only be damaged or knocked loose.

PORTERFIELD

FINAL ASSEMBLY

The control horns are attached to the control surfaces, and the tail group is mounted to the fuselage. The horizontal stab fits between two stringers, and the vertical stab rests on top of it between the two top stringers. There's quite a lot of open space where both surfaces are mounted, and the instructions tell you to fill this in with scrap balsa. Since there's nothing in the instructions about letting air flow out of the fuselage, I decided to epoxy the tail group into place and leave this area open for an air-cooling vent. (I had seen this method used on another Porterfield.)

The wood-and-wire pushrods exit the rear of the fuselage between the stringers just below the horizontal stab. No exits are provided, so I covered a small MonoKote area with red electrical tape and cut a slit in it so that I could pass the pushrod through it.

The wing struts in the kit are made of $^{1}/_{8}$x$^{3}/_{8}$-inch spruce sanded to an airfoil shape. This looked like a lot of work, so I purchased K&S* airfoil-shaped aluminum tube and made the struts out of this material and the supplied attachment plates.

RADIO AND FLIGHT SYSTEM

The radio gear and battery pack fit in the bottom

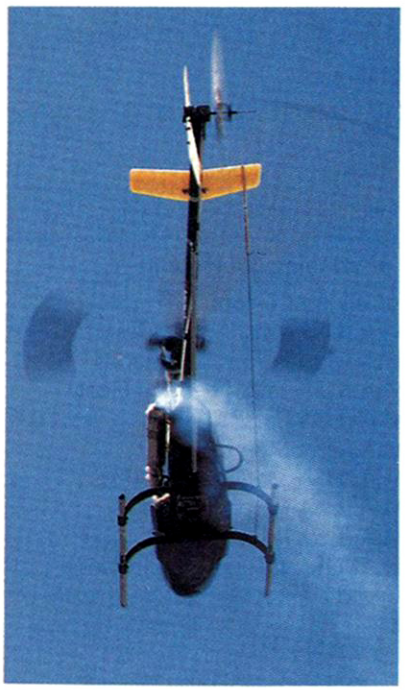
(Continued on page 103)

by PAUL TRADELIUS

PHOTO BY GARY KURTZMAN

KALT CYCLONE II

A QUICK WAY INTO THE AIR



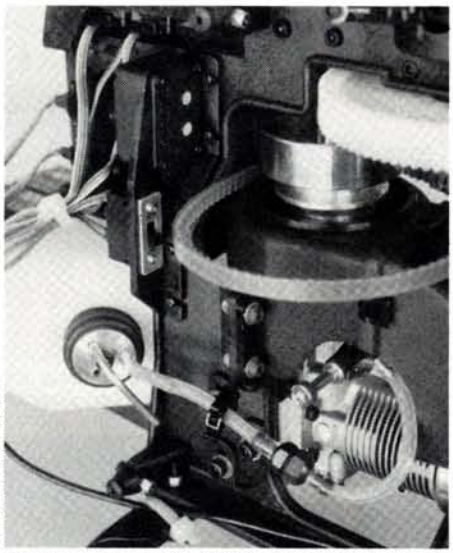
KALT'S* CYCLONE is known for its durability and simple construction. Kalt's new Cyclone II has these desirable traits too, but it's even easier to maneuver than its predecessor. The Cyclone II is available both as a standard and a semi-finished kit in which most of the work has been completed by the experts at the factory. I wanted to begin flying this heli quickly, so I chose the semi-finished version.

The Cyclone II comes in a rather large box. This is unusual, because helicopter kits are famous for coming in small packages that contain thousands of little parts that must be accurately assembled to produce the finished product. The Cyclone II semi-finished kit consists of only a few large pieces; in about five hours, this heli was completely assembled and ready to fly.

SPECIFICATIONS

Main-rotor diameter: 55.11 inches
Tail-rotor diameter: 11.125 inches
Length: 50.39 inches
Weight: 8.9 to 9.1 pounds
Radio: 5-channel
Engine: .49 to .50

The Cyclone II features Bell-Hiller mixing, autorotation, balanced rotor blades, tooth belt drive and a high-performance K-5 rotor head.



PHOTOS BY PAUL TRADELIUS

The gyro control unit and the on/off switch have an easy-to-reach mounting point. Even a fuel shutoff and in-line filter are provided.

In any new kit, I always look at the instructions first. This takes some effort, especially when I'm dealing with a kit like this one—all those large, assembled pieces just waiting to be picked up—but I've found out the hard way that it's better to follow the instructions from the very beginning than to use them to get out of a jam. The instruction booklet isn't very big, but with this type of helicopter, it doesn't have to be. Each major assembly is very well described, and there are many diagrams showing how the sub-assemblies fit together. This is probably the ideal way for novices to get into helicopters; all the difficult work has been completed for them!

The first major unit you work with is the assembled main frame. It includes: an installed Webra 50 engine that has a clutch, a cooling fan and a shroud; a fuel tank; a main shaft and gear; and the entire swashplate assembly. Of particular note is the high-quality fiberglass composite of which the side frames, landing gear, servo-mounting bracket and radio bracket are made. It appears to be almost unbreakable. This unit is so complete that it comes with bellcranks and pushrods installed.

When building almost any helicopter, one of your biggest problems is figuring out where to mount the on/off switch and the gyro control unit. Manufacturers don't seem to give much thought to this dilemma, and builders must usually find the spot themselves. Not so with the Cyclone II! Its side frame has a bracket for the switch and the unit that's convenient and out of the way of fuel and dirt. A molded cutout for the rear-mount gyro keeps it as close as possible to the main shaft for maximum effectiveness.

First, bolt the landing gear to the main-frame unit and then attach the tail boom and rotor system. The entire tail-rotor unit is assembled at the factory and is mounted to the tail boom with its vertical and horizontal fins in place. The toothed drive belt is fed through the tail boom and slides around the drive gear, which is beneath the main gear.

RADIO

Install the radio equipment in the fully adjustable fiberglass servo mounts. The kit's self-tapping screws really bite into the fiberglass and ensure a very secure mounting system. I installed the JR* Max Computer 6-channel helicopter radio—a complete, narrow-band system with a large 1000mAh battery and five sport servos. This intermediate radio doesn't have all the intricate functions of the PCM 10, but it's extremely user-friendly and has all the functions that novice or intermediate fliers could want. (It has an LCD readout, too.) I replaced a sport servo with a ball-bearing JR 401 servo, however, for the collective function. The gyro is a small, light JR 120 BB that's sensitive enough to suit just about any helicopter. I used double-sided mounting tape to mount the receiver, the battery pack, the gyro and the gyro amplifier unit; it's quick, neat and resists vibration. Then I attached the pushrods—virtually no adjustments required. Each pushrod has a clevis on one end, and the other end is bent into a "Z" shape to fit through the servo arm. Although I like to use ball links on both ends of the pushrods, I installed the kit's pushrods as they were. The entire control system is tight and virtually slop-free.

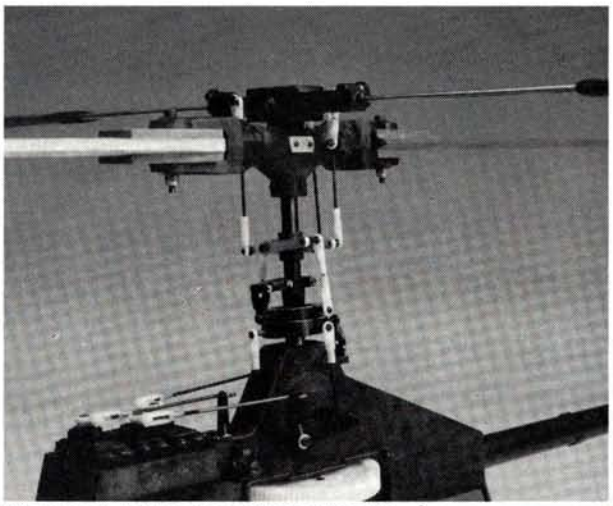
Attach the head to the main shaft, and install the pushrods according to the diagrams. The main rotor blades aren't covered, but heat-shrink covering is provided. One of the problems with heat-shrink covering is that, at high rpm, the covering can come off the top of the blade. To prevent this, I recommend that you first coat the blades with Coverite's* Balsarite, which is a heat-actuated adhesive that will keep the covering attached to the blade.

There's plenty of room at the front of the molded servo tray for the receiver, the battery, etc. The servo tray can be adjusted for any size servo.

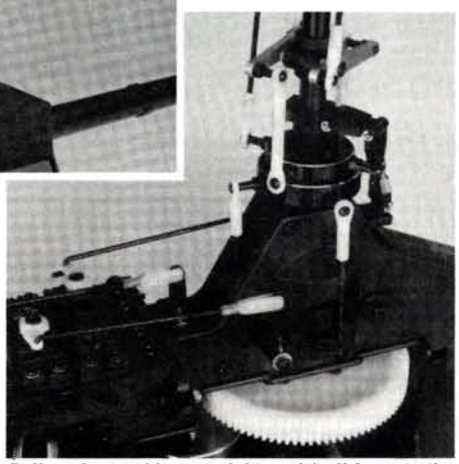
The trimmed canopy halves are ready to be joined (the glue is provided). After you've attached the tinted windshield, finish the canopy with paint or stickers to suit your taste.

As you can see, there really isn't much you have to do to get this helicopter off the workbench and into the air.

Although the quality of the materials is excellent, I think that these few recommendations will improve this fine helicopter.



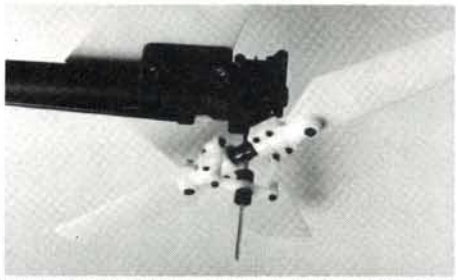
The rugged, ball-bearing-supported head is massive, but it's made of light composite materials.



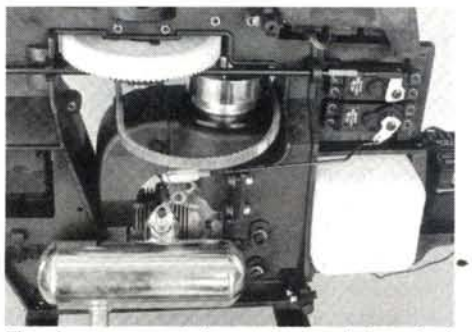
Bellcranks provide a straight push/pull force to the swashplate.

- The horizontal and vertical fins provided are made of yellow plastic, but the canopy is white. It would be nice if the fins and the canopy were of the same color so that modelers could choose an appropriate color scheme.
- The main-rotor blades are made of several laminations of wood, with heavier wood at the leading edge. The chordwise CG is at approximately the 40-percent chord—rather far back for good handling and performance—and no provision has been made to add tip weight to move the CG forward and improve autorotations.
- No exploded-view diagram has been provided to show all the parts of the helicopter. A parts list is provided.

CYCLONE II



The belt-driven tail rotor comes with plastic rotor blades and a plastic tail fin for quick, easy assembly.



There's a rear-mounted gyro cutout and a large fuel tank up front. The highly polished Kalt muffler really adds to the appearance.

FLIGHT CHARACTERISTICS

Only minor tracking and trim adjustments were needed to bring the Cyclone II into a smooth and stable hover. I believe one of the reasons it's so smooth is that it uses a belt starting system, thereby eliminating the starter shaft and those alignment problems. Reducing the swashplate movement made the helicopter very gentle and easy to control, even in a stiff wind. The large vertical fin was especially helpful in hovering, since it acted like the feathers on an arrow to keep the nose pointing straight into the wind.

The Webra 50 was everything you'd expect of a Webra: easy to start and adjust, good top-end power and a smooth, reliable idle. The TN carburetor with its high- and low-end mixture adjustments provided a smooth transition from idle to top end without any "sagging" or mid-range rich spots. Power was more than adequate for hovering, normal forward flight and most aerobatics. Kalt also offers an add-on package that enables you to use a .60-size engine with the Cyclone II. That will be my next project—to see what improvements the added power will make to its overall flight and aerobatic capabilities.

Overall, I was very pleased with the entire project. If you're looking for a rock-solid first helicopter—with stable flight characteristics and adequate power—that's capable of taking a beating, this is the one you should consider.

**Here are the addresses of the companies mentioned in this article:*
***Kalt**; distributed by Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.*
***JR Remote Control**; distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826.*
***Coverite**, 420 Babylon Rd., Horsham, PA 19044.* ■

ROTARY-WING ROUNDUP

NEW HELI PRODUCTS

Descriptions of new products appearing on this page were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute an endorsement by **Model Airplane News**, nor guarantee product performance or safety.

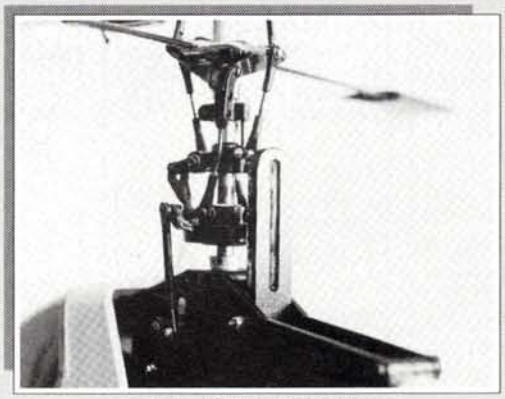
GLOBAL HOBBY DISTRIBUTORS
Black Shark .30 / Ecureuil .30 Helicopter Bodies

EZ's new light Tufflex ARF bodies will fit Kyosho, Kalt, or Hirobo helicopters with displacements from .25 to .32. The durable Tufflex construction ensures long-lasting beauty. Each kit includes: fully cut and partially assembled body parts; clear plastic windshields and windows; die-cut balsa and ply parts; mounting hardware; colorful decals; and step-by-step instructions. (Black Shark 30—45.27x9.45 inches; 10.58 ounces. Ecureuil 30—48.03x6.5 inches; 14.11 ounces.)

Part nos. 101044 (Black Shark 30); 101046 (Ecureuil 30).

Price: $200

Global Hobby Distributors, 10725 Ellis Ave., Ste. E, Fountain Valley, CA 92728; (714) 963-0133.

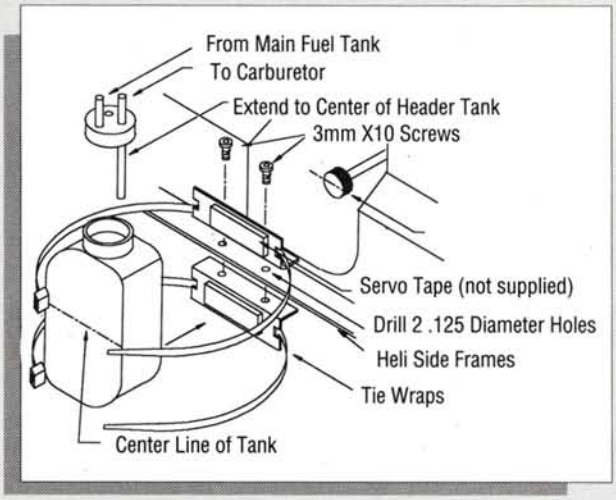


B&B ENTERPRISES
Swashplate Anti-Rotation Link

Designed for Hirobo Shuttles and MAS X-Cell series helicopters, this affordable, simple, bolt-on design is made of tough polycarbonate. It prevents the swashplate from "cross-coupling" and allows smooth collective-pitch inputs. Guaranteed against breakage for the life of the helicopter. Available for all Shuttle and X-Cell .30- to .60-size choppers.

Price: $15.95 ($1.05 S&H)

B&B Enterprises, P.O. Box 2394, Taunton, MA 02780.



HEL-X CORPORATION
Header-Tank Kit

This kit includes a Du-Bro 2-ounce auxiliary fuel tank that fits between the main tank and the carburetor and provides consistent fuel flow as the main tank empties. It isolates the engine from the effects of fuel foaming and the momentary pick-up of air by the main-tank clunk during aerobatic maneuvers. Designed to fit most .30- to .60-size helicopters, the kit also includes stainless-steel mounting brackets, mounting hardware and nylon tie-wraps.

Part no. A1020

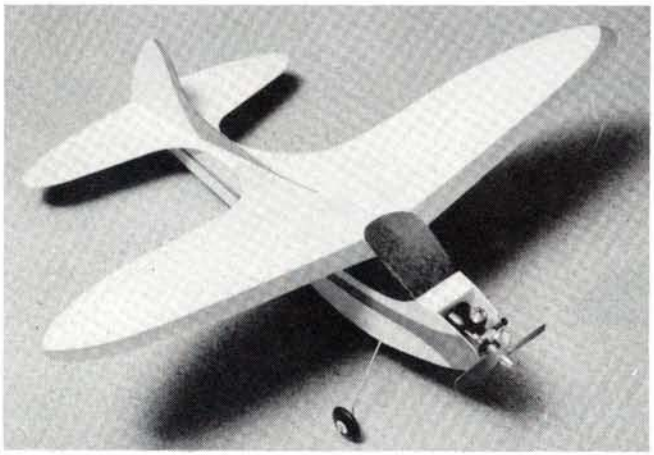
Price: $12

Hel-x Corporation, 558 Highland Ave., Upper Montclair, NJ 07043; (201) 744-4962.

SMALL STEPS

JOE WAGNER

THE SMALL CAN TAKE A FALL



Another neat micro-size model is this .010-powered craft by Steve Staples of Little Rock, AR. It's based on an unpublished 1960 design by AMA Hall-of-Famer H.A. Thomas.

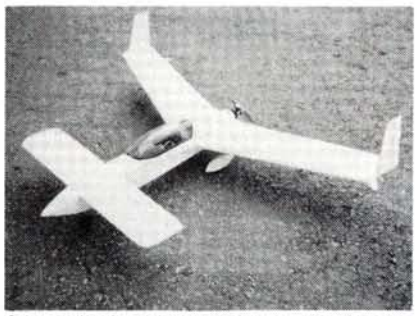
AERODYNAMICS, though usually considered a science, contains enough paradoxes and contradictions to keep aircraft design from ever becoming a strictly "by-the-numbers" procedure. A good example of this shows up in the familiar "scale effect," wherein aerodynamic efficiency increases as the size of a model increases. The "giant-scale" gang often takes advantage of this. Their huge planes fly comfortably with *far* heavier wing loadings than our small aircraft.

Yet, in one area, there's a distinct *loss* of efficiency with large models. When it comes to unconventional configurations, small is sometimes the only way to go. Think about it; bumblebees, hummingbirds and June bugs couldn't fly if their wingspans extended meters instead of centimeters. The same is true of certain offbeat model airplane configurations. Cierva autogyros, i.e., those with one rotor and fixed-pitch blades, are a good example.

In general, whenever you experiment with a far-out model, starting with a small, lightweight prototype will save considerable time, expense, trouble and damage during "de-bugging" flights. Without getting in to math, a quick look at some of the obvious stress, velocity and inertial effects of model airplanes will show the advantages of small aircrafts:

- **"The bigger they are, the harder they fall."** Years ago, I had a 24-inch Fokker monoplane that once hit a cement-block wall—head-on—without being damaged. Its extremely light, flexible structure absorbed the impact. A 6-footer wouldn't have been so lucky!
- **"The longer a lever, the greater its mechanical advantage."** If a model with long wings cartwheels during a landing, stresses at the wing/fuselage junction would cause it to be demolished. A short-span craft, however, would be able to survive.
- **"Impact force is a multiple of weight."** Road-running athletes know that, with each step, their feet strike the road with an impact that's three times their body weight, because each fast-falling foot meets instantaneous counteracting pressure from the rigid pavement. The same effect occurs when a model airplane hits an unyielding obstacle.

Of course, a few unconventional R/C aircraft have to be big. Flying saucers,



Gary Bullock of Balsam Grove, NC, demonstrates an unconventional miniature configuration—a .010-powered "Tini-EZE."

Snoopy's dog house, aerial lawn mowers—often, designs such as these are like kites carrying their own wind generators. As such, they can't depend much on aerodynamic stability. Inertia and air pressure on movable control surfaces keep these "flying funnies" from tumbling erratically through the sky. For projects like

Park Fleming of Little Rock, AR, did a fine job decorating this 2-channel, .09-powered "Dicky Bug." It's another good example of an unusual R/C configuration that works well in a small size.

PHOTOS BY JOE WAGNER

this, don't think small; bigger is better!

For just about all other flying model configurations, however, small craft perform very well indeed. That's the reason for the constantly decreasing size and weight of modern R/C airborne equipment. And even tinier and lighter stuff is on the way! I've been pledged to secrecy about the details, but I *can* reveal that at least two incredibly miniaturized digital proportional R/C systems will be on the market this year.

Electronics manufacturers surely wouldn't invest their money to produce tiny R/C gear for controlling mini R/C airplanes if it weren't eminently practical!

**Here's the address of the company mentioned in this article:*
***RJM Systems,** Unit #3, Sandy Hill Rd., R.D.#6, Irwin, PA 15642.* ■

NEW FIELD CHARGER

There's certainly no shortage of Ni-Cd battery chargers on today's hobby market. You wouldn't think there would be a need for another, yet Bob Markle of RJM Systems* (maker of fingernail-sized, high-efficiency electronic speed controllers) is offering a newly designed Field Charger with a unique capability: you can use it to charge up to 10 cells! It's completely automatic, too. No timer is needed; when the batteries reach peak voltage, the charger goes into the trickle mode, and you can leave it connected indefinitely.

RJM's new charger (and an inexpensive Radio Shack voltmeter) provides a foolproof way to recharge "odd" Ni-Cd packs—at home or in the field. The 2-cell pack shown here has almost reached its peak of 2.92 volts, so the indicator bulb barely glows.

I obtained a prototype RJM Field Charger several months ago, and I've found it ideal for the small-capacity Ni-Cds that I use in my mini R/C flying. While recharging 100mAh packs using earlier methods, I've often forgotten to disconnect them in time, and I've shortened the life of several packs. With the new RJM unit, though, my problems are over!

Here's how this setup works. You need a 12 to 16V DC power supply, i.e., a gell-cell battery or an automobile-alternator output, and an inexpensive digital voltmeter. Connect the charger to the power supply, and plug the voltmeter leads into the appropriate sockets on the charger. Now, multiply the number of Ni-Cd cells in the pack you plan to charge by 1.46, and turn the charger's control knob until your voltmeter reads that value. Finally, connect the charger output leads to your Ni-Cd pack. The light bulb, which acts as a current limiter, will glow to indicate that the unit is charging. The bulb will be bright at the start, and it will gradually dim and then go out when the charging has been completed.

Bob's new charger also works well for recharging the "odd" Ni-Cd packs of small electric-powered models. It isn't as fast as many of the high-amp, timer-controlled chargers on the market, true, but it's a great deal safer!

Three versions of the RJM automatic charger should be available soon. The smallest has a peak output of approximately 500mA; the two larger models produce 1.5 and 4.0 amps, respectively. RJM's $2 catalogue describes them in detail.

PORTERFIELD

(Continued from page 91)

of the spacious fuselage. I chose Futaba's* Conquest 4NBF for its trainer system, which I was going to use to teach my 7-year-old daughter how to fly "power." The full-size servos and 500mAh battery pack are literally swallowed up by the Porterfield. The 14-cell 900mAh battery pack fit right down the middle of the fuselage with the radio gear and servos on either side, and the Astro 205 ESC fit directly behind the motor.

The supplied motor-mount tube for the Cobalt 25 is supposed to be mounted on the firewall with self-threading screws. I mounted mine with 4-40 socket-head screws and blind nuts. This is a very powerful motor, and I felt better knowing it was securely mounted. Oddly enough, the firewall in my kit had a hole drilled in it for a Cobalt 15, even though the kit came with a 25. There's a second circle drawn on the firewall for the 25. This hole has to be opened, and two cutouts have to be made so that the motor brushes can fit. The motor, the speed controller and the battery pack were fitted with Sermos* connectors. The model balanced without additional ballast.

CONCLUSION

Even though I felt the kit's "thin" instructions made the building process more difficult than it had to be, the model's flight performance more than made up for it. It's a great flier, and the Cobalt 25 is an impressive electric powerplant that really narrows the gap between electric and glow power. It's an enjoyable model to fly and a good way to introduce people to the virtues of quiet flight. I've let many people—electric fliers, glider guiders and power pilots—fly the Porterfield, and I've definitely created some converts to bigger electrics!

**Here are the addresses of the companies mentioned in this article:*
***Astro Flight Inc.,** 13311 Beach Ave., Marina Del Rey, CA 90292.*
***MonoKote/Great Planes Distributors,** P.O. Box 9021, Champaign, IL 61826.*
***Pactra Inc.,** 620 Buckbee St., Rockford, IL 61104.*
***K&S Engineering,** 6917 W. 59 St., Chicago, IL 60638.*
***Futaba Corp. of America,** 4 Studebaker, Irvine, CA 92718.*
***Sermos R/C Snap Connectors,** Cedar Corners Station, P.O. Box 16787, Stamford, CT 06905.*
***Zinger;** distributed by J & Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.* ■

A-10

(Continued from page 73)

sheet to the top of the fuselage side. Use the scrap piece left after you've cut out the fuselage sides for this.

Next, take the lite-ply fuselage doubler and glue it into place. It's absolutely essential that you make the fuselage halves "identical," but be sure to make left and right sides. Position and glue all the triangle stock into place.

(Continued on page 105)

A-10

(Continued from page 103)

After cutting out the fuselage bulkheads, drill holes for the flexible pushrod. Now position bulkheads F-4, F-5 and F-6. (Use a right angle to ensure proper alignment.) Stand the fuselage halves up and glue them together at the center bulkheads. Centering the upright fuselage over the plan, install bulkheads F-1, F-2 and F-3 in that order. You may need to make relief cuts in the triangle stock to accommodate the bends in the fuselage sides. Now go to the tail of the fuselage and follow the same procedure. Install the 3/32-inch sheet-balsa doubler. At all times, be sure to measure the assembly and correct any misalignments.

Glue in the elevator pushrod, and install the top and bottom 1/16-inch sheeting. Shape the nose and tail balsa blocks, and glue them into place. Install the power pod and and drill appropriate holes for it and wing dowels. Cut and shape the canopy hatch, and use a 1/16-inch-thick balsa lip in the front and two small screws in the rear to hold it in place.

Now sand the entire fuselage. Be sure to round the corners until about 1/4 inch of the triangle stock is visible from the outside.

The A-10 just wouldn't be complete without the 33mm Gatling gun, which you make by gluing a piece of 1/4-inch dowel to the end of a piece of scrap balsa block to fit under the nose of the aircraft. Fit it, but don't glue it yet. Paint the entire gun assembly flat black; cover the fuselage with iron-on covering; install the pilot, instrument panel, seat and Gatling gun; mask, paint and install the canopy.

Though A-10s look pretty much alike, their markings do vary. Choose a particular plane that you like, and duplicate its markings. With the exception of sharks' teeth or even warthogs' teeth, most markings are flat black.

POWER POD

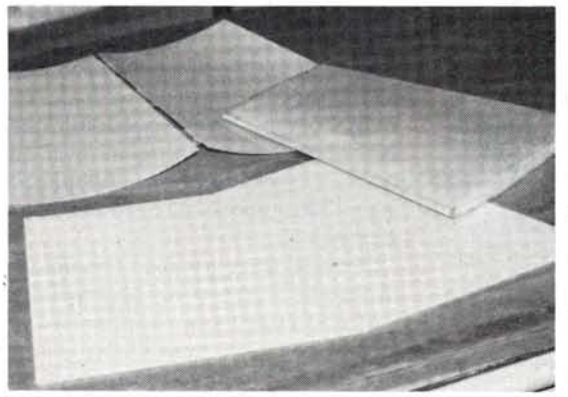
The power pod consists of the power-pod bar and the engine housings. The bar is made out of two pieces of 1/8-inch-thick lite-ply laminated together using CA. Following the plan outline, cut and sand to fit. The entire unit is bolted to the fuselage at the power-pod base using 4.40x3/4 bolts and blind nuts. Be sure to use no. 4 washers and locking washers. Now glue the triangle stock pieces into place and sand them. Drill mounting holes to match the power-pod base, and test-fit all the bolts and blind nuts. Test-fit the engines and drill holes for them. Using Formula-U, spray paint the entire power-pod bar olive drab.

The engine housings are made out of two-liter plastic soda bottles. If you go to the grocery store, you'll notice that the colored plastic bases on the bottles differ. Some are smooth and rounded, others are straight sided and conical; the rounded shapes are used for the inlet, and the straight-sided conical ones are used for the rear of the housing. *(Continued on page 123)*

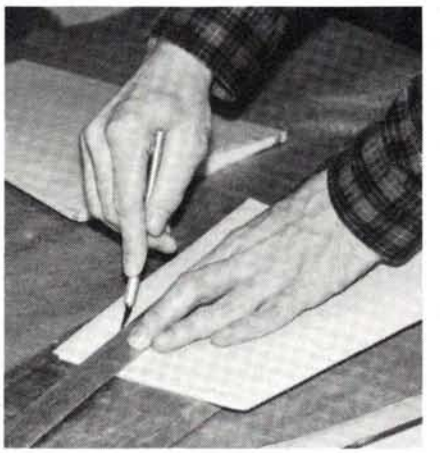
CENTER ON LIFT

MICHAEL LACHOWSKI

EASY SHELL CONSTRUCTION



Left: the interior mold. Rohacell (foreground) has been cut to shape for the shell. Taped Mylar will be used to vacu-bag the exterior surface. Right: if you like sailplanes, you'll want this catalogue.



Left: form the Rohacell by warming it with a heat gun. Work carefully to prevent cracking and overheating. Right: after heat-forming the leading edge, trim the trailing edge so that the fin chord is correct along its length. Sand a taper along the interior surfaces of the Rohacell trailing edge so that the proper airfoil contour will result when the trailing edge is closed.

The mold, formed Rohacell and cut fiberglass are ready for bagging.

I HOPE you have your copy of Northeast Sailplanes'* 1992 catalogue. As usual, Sal and Stan have put together a great reference for anyone who is involved in R/C soaring, and it's only $5. More than a catalogue, it's filled with concise descriptions and measurements of more than 120 sailplane designs that range from slope to cross-country. Sprinkled throughout the catalogue are 32 articles on a variety of soaring topics, and most are new for 1992. If it had three-views and all the dimensions, NSP's catalogue could be called "All the World's Model Sailplanes."

"SANDWICH" SKIN SECRETS

Building composite sailplanes is now common, but hollow-shell construction is only for the truly dedicated. Shell construction uses a thin "sandwich," or laminate of fiberglass and foam that's shaped to the desired contours. The laminate is used to create the wing's top and bottom surfaces, which are vacu-bagged in or over a mold. The cured laminate retains the mold's shape, and the upper and lower surfaces are joined to form a hollow interior.

Typically, the shell is made with a negative mold to produce a very precise airfoil surface. Mold construction is time-consuming, and some builders actually "CNC-cut" the molds, i.e., they use computer numerical control! This is just too much work for the average builder.

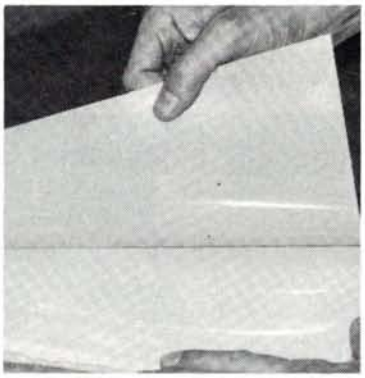
I like the idea of using a shell for the fin, because it's easier to install and set up the elevator linkages or the bellcranks in the hollow interior. The question is how to build a shell quickly and with minimal work. With normal vacu-bagging techniques, you can make a shell by using a mold of the hollow interior. The pictures show the construction steps for the fin of my Aeolus 92.

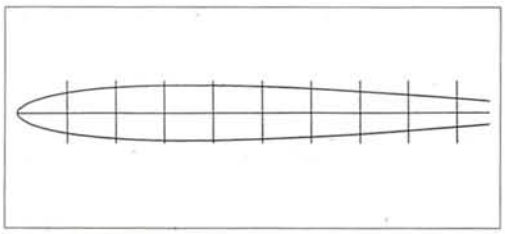
The mold can be easily vacu-bagged once you determine the proper shape. The shape must account for the thickness of the shell, which can be created with any good airfoil plotting program, such as Chuck Anderson's Model Design Program* or Cygnet Software's* Foiled Again. I used

(Continued on page 108)

Left: apply an extra layer of fiberglass to the leading edge of the folded, heat-formed Rohacell. Some final sanding may be needed. Right: after you've wetted out the interior fiberglass layer on release film and wrap it around the mold, slip the Rohacell over this. Place this inside the outside layer of fiberglass and Mylar.

Top: the cured fin just out of the vacu-bag. Right: the Mylar is peeled off leaving a smooth finish. Next, remove the shell from the mold.

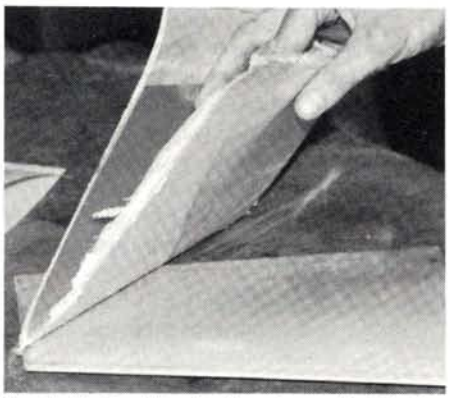




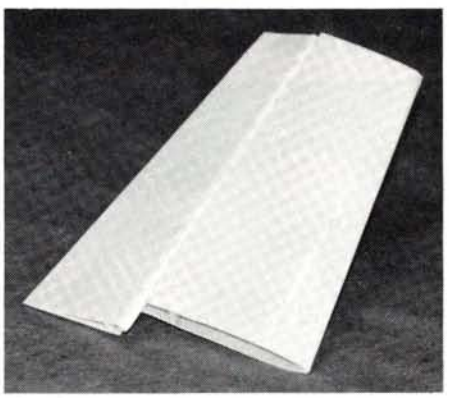
Left: this template for an interior foam mold is used to create a composite shell. To increase mold stiffness, the trailing edge is 1/4 inch thick. To accommodate the shape of the mold, the SD8020 airfoil has been opened slightly at the rear to reflect the shape of the mold. This adds strength and separates the trailing edge so it's easier to remove the mold.

1.5mm Rohacell and layers of 1.4-ounce fiberglass (available from Aerospace Composite Products*, Composite Structures Technology* and Weston Aerodesign*). The mold, which consists of foam that has been cut to the modified airfoil shape, has a shaped, spruce, leading edge and a 1/4x1/2-inch spruce trailing-edge extension. The illustration shows the airfoil and the shape of the foam and spruce. To finish the mold, vacu-bag a few layers of 3/4-ounce fiberglass over the foam-core (with the Mylar taped together at the leading edge), and clean the surface after curing.

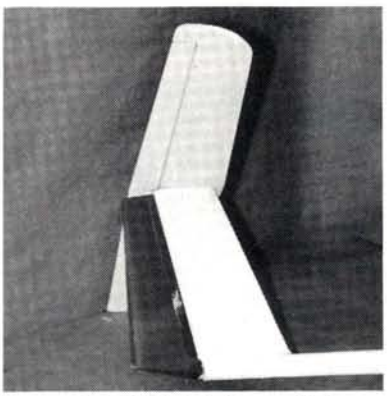
Rohacell foam is a good selection for the interior section of the shell wall. Cut the foam so that it's oversized, and wrap it around the mold's leading edge using a heat gun. Be careful not to crack the Rohacell, and don't overheat and blister the glassed mold. Trim the trailing edges equally on each side, and taper the Rohacell at the trailing edge with sandpaper. Now you're ready to vacu-bag the shell. Cut the fiberglass or Kevlar for both the interior and exterior surfaces, and cut an extra strip for the leading edge. Put the inner layer of cloth on some release film and the exterior cloth on the Mylar, and "wet out" the cloth with epoxy. Tack an extra strip on the Rohacell's leading edge and wet it out. Now wrap the release film around the mold (with cloth on the outside of the film), slip the Rohacell over the mold, and place all of this on the Mylar as you would with normal vacu-bagging. Fold the Mylar over, put the lay-up in the



The shell before trimming the edges and joining the trailing edge.



Glue vertical spars inside the shell before you cut the rudder. This fin is designed for a tape hinge.



The completed fin installed on my Aeolus.

vacu-bag, and wait for it to cure.

Remove the cured lay-up from the vacu-bag and peel off the Mylar. Slide out the interior mold, and release the film, which leaves the shell. Trim the edges, and join the shell at the trailing edge. You now have a completed shell.

If you intend to paint the surface, I recommend that you paint the Mylar. This minimizes pinholes when you bag over the Rohacell, and the paint transfers nicely. You can cut out any control surfaces and finish the edges using your favorite methods. In a future column, I'll talk about how to cut and surface-hinge a control surface without creating gaps.

**Here are the addresses of the companies mentioned in this article:*
Northeast Sailplane Products, *16 Kirby Ln., Williston, VT 05495.*
Model Design Program, *Chuck Anderson, P.O. Box 305, Tullahoma, TN 37388.*
Cygnet Software, *3525 Del Mar Heights, #237, San Diego, CA 92130.*
Aerospace Composite Products, *P.O. Box 16621, Irvine, CA 92714.*
Composite Structures Technology, *P.O. Box 4615, Lancaster, CA 93539.*
Weston Aerodesign, *944 Placid Court,*

DAVID B. FRASER SCHOLARSHIP

David B. Fraser was killed this year in a plane crash while attempting an emergency landing at Wheeling-Ohio County Airport near Wheeling, WV.. Fraser, Michael Selig and John Donavan wrote *Airfoils at Low Speed* (Soartech 8). The David B. Fraser Scholarship for Science has been established. The initial contribution to endow this fund comes from the Fraser family and Fraser-Volpe Corp.—a company that Fraser founded with Joseph B. Volpe Jr. in 1972. Eligible recipients will be selected from any student applicant who is studying science or engineering. Contributions may be sent to the David B. Fraser Scholarship for Science, c/o Mr. Jonathan Fraser, 1335 Slayton Dr., Maple Glen, PA 19002.

by DAVID C. BARON

SR's new charger comes with Sermos connectors—for all connections—in the unit. Absent are the external power cords that hang off competing units.

Charge and cycle 2 to 28 cells

SR BATTERIES

Smart Charger/Cycler

FOR YEARS, the chargers for electric-powered flight have fallen into two categories: peak-detecting and time-elapsed. To be fair, these two categories can usually be broken down into two more categories based on how many cells you can charge at once: six to 12 or seven to 28. If you take more than one electric plane to the field, they don't necessarily have the same charging needs. You probably spend a portion of your flying time waiting for your charger(s) to top off your batteries, not to mention the work involved in lugging around an extra field box full of the assorted equipment necessary to solve any charging or discharging challenge. The shortcomings are obvious, and so is the space that all this paraphernalia takes up in your car.

Well folks, relief is in sight. SR's* newest product is a charger/cycler, and it's the first one I've used that's truly tailored to suit all of our charging needs. It offers more capability in one box than any of the items we diehards regularly lug back and forth between the workbench and the flying field.

The charger's capabilities include:

- **Peak/temperature-detecting charger**—any pack from 2.4 to 33.6 volts (two to 28 cells); charge current variable from 0.1 to 5.0 amps; time and temperature protection system; constant (expanded-scale) monitoring of both the batteries on charge and the source-battery voltage (applies to all charge modes).
- **Fast field charger for 4.8V packs**—adjustable rate of charge; terminates at 75 to 80 percent of charge and automatically switches to slow rate.
- **Slow charger**—variable from 0 to 200mA; this mode is automatic after either of the systems' fast-charge modes has finished.
- **Battery discharging**—discharges both motor packs and radio packs; display reads capacity of pack in milliamps when complete; variable discharge rates from 100mA to 1 amp (in 100mA increments); automatic cell-count mode detects shorted cells.
- **Ammeter**—essential for matching batteries to motor systems and matching propellers to motors and aircraft types; 0 to 250A scale; sensitive to 0.1 amp.

SIMPLICITY OF OPERATION

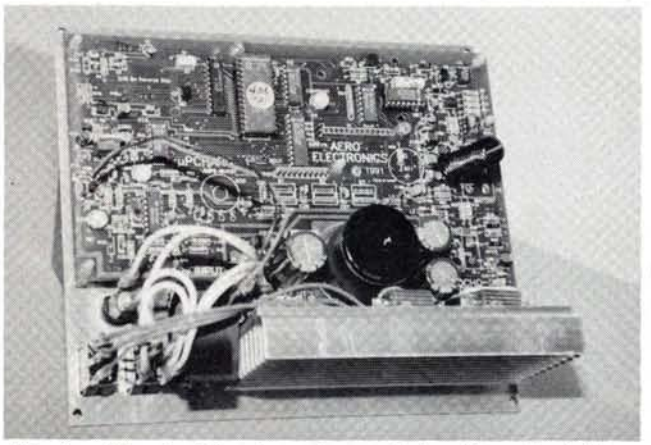
The members of the design team at SR have outdone themselves to make this unit easy to use. All the button sequences that access the modes of operation are on the faceplate, and you simply tell the unit the cell count and the current rate desirable for the mode you're in. It's that easy!

PEAK-CHARGING POINTERS

With this system, it's easy to simultaneously charge up to 28 batteries in series as long they all have the same capacity. I design most of my motor systems around 1000mAh SCR cells, and I have them in many different configurations. When I first arrive at the field, I connect them in series and charge them in groups. This way, instead of having to wait for batteries, I always have them waiting for me.

I've heard of people who criticize the use of peak-detecting chargers to charge many cells at once. Their chief complaint is that the charger won't charge all the packs to capacity because there's bound to be one with a partial charge that will peak and fool the detection circuit into stopping the charge. I don't think this is a problem, because it's easy to touch each pack after the charger has switched to the low rate. Any pack that's warm to the touch should be removed from the connections, and the remaining cool packs should be connected in series and plugged back into the charger, and then the charger should be switched

The Smart Charger/Cycler is shown connected to the optional Hitec AC power supply.



This view of the circuit board reveals several microchips, a heat sink and a fan—very clean layout.

back to the high rate. This method takes the same amount of time to charge all packs as it would take for the weakest pack in the group to be fully charged.

One of this unit's really smart automatic features is its ability to warn you of low-voltage problems in your power supply. At a recent contest, a modeler thought that his charger had finished charging when the indicator showed that it had finished and switched to a low rate. He installed the packs in his pattern ship and took off. The aircraft was only a few feet in the air when the motor sagged, and the plane stalled and crashed into the pits—narrowly missing contestants and damaging several aircraft. The problem was that the source battery had dropped to a voltage that was too low, and the charger defaulted to the slow-charge mode. With the SR Smart Charger, the display shows the loss of adequate source voltage with a message. The charge is terminated until the message is removed by the owner.

FAST RADIO-PACK FIELD CHARGING

This feature is becoming more important all the time as our airborne flight packs get smaller and smaller in an effort to reduce the weight of our aircraft. To fly safely, we must top off these packs often. This unit's fast field charger is completely adjustable and capable of charging a wide variety of cell sizes in a fast, safe manner.

You simply set the charge rate for the "C" rate of your battery, i.e., if your pack has a 300mA capacity, then that's the recommended rate of charge at the "C" rate. Based on this, the charger will automatically switch to the slow rate when the pack is between 75 and 80 percent charged.

SLOW CHARGING

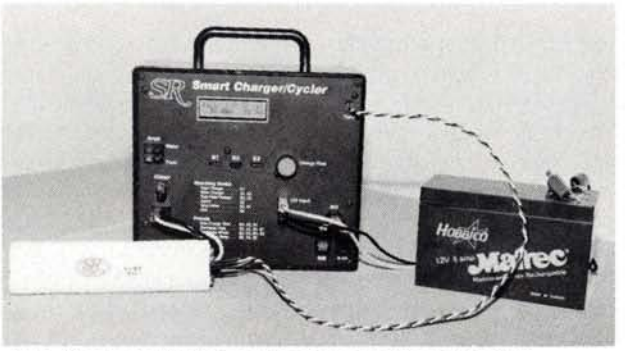
This capability is for the rest of your charging needs. It's fully adjustable from 0 to 200mA, and it can be used for up to 28 cells. If you wanted to charge three of your transmitter packs at the field, you would connect them in series, and pick a charge current that suited your needs. You can use 50mA for overnight charging; 200mA is good for a fast, 2.5-hour charge. Bear in mind that you're responsible for the duration of the charge in the slow-charge mode!

DISCHARGING AND CYCLING

This procedure is typically the least used, yet it's the most needed. Nothing is more important to the electric flier than the capacity of his batteries—under the appropriate load.

If you install a standard 500mA-type battery in a typical, medium-size, 4-channel sport plane, it's expected that the battery will be good for six 15-minute flights. Using this logic, the receiver and the servos must be drawing an average of 333mA while the plane is flying. You would then use either the 300 or 400mA discharge setting in the cycler to test a pack of this type in such an airplane. After charging and discharging in a single cycle, you can see whether your battery is performing up to capacity. Multiple cycles can optimize a pack's performance.

If you're unsure about which setting to use, fly your plane for only half of what you think is safe, and then discharge the pack at the 400mA setting. Read the capacity remaining in the display. If it's more than half of the battery's capacity, then you know that you could have flown twice as long as you did. After you've used each battery, it's good practice to discharge it and identify the remaining capacity to determine its safe limit. You may find that it has enough life for more flying, or that it's almost exhausted.



Here, the charger/cycler is powered by a Hobbico 12V battery.

SELECTING MOTORS AND BATTERIES

To help you determine the best pack size for your flying style, measure the current draw of your power system on a test stand. Say that your new glider has a full-throttle load of 15 amps, and you're using seven 1000mAh SCR cells. Increasing the pack size to eight cells will increase the amperage while decreasing the duration. While measuring amperage, you can add one cell at a time and safely go up to the limit of your motor and/or speed controller's total wattage rating (watts are measured as volts x amps) without exceeding it, which could permanently damage your equipment. As a side note, I don't recommend that you run a motor on the ground or in a test stand at full throttle for more than 30 seconds; it won't receive the cooling airflow that a well-ventilated motor receives during flight.

CHOOSING MOTORS TO FIT A TASK

If you have a collection of motors from past and present projects, sort them into groups based on how many cells each has proven most comfortable with. Test each group using an identical prop (your load), and label the rpm and amps that each motor draws—with a fresh battery—at full power. Measure the rpm in the first 10 seconds of motor run. Bear in mind that a motor's timing can affect these measurements.

When you test a motor with adjustable timing, I recommend that you take three sets of mea-

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(Continued from page 105)

The bases come a variety of colors and shapes, but black and green seem to produce the best results. To take these off the soda bottles, turn the bottle upside-down, and you'll see three or four holes in the base. Using an X-Acto knife or a Dremel tool, make a cut to connect the holes, and the base should come right off. Now take the empty bottle and, using scissors, cut off the top and bottom to leave the cylindrical center section. Now you should have a clear center section and two colored bottle bases.

Sand the inside of the bases and the outside edge of the center section. Using Pacer's* Zap-a-Dap-a-Goo, install both bases on the ends of the clear section. Following the plan, make all the appropriate cuts in the housing, and then spray-paint the outside with olive-drab Pactra* Formula-U paint. Slide the housing onto the power-pod bar, and secure it with 1/32-inch ply retaining clips and screws. Put the engines in the housings and secure them with screws. Use epoxy or servo tape and plastic tie-wraps to hold the fuel tank in the center of the power-pod bar. Be sure that it's secure. Each engine has its own line coming from the fuel tank. On the prototype, the vent pipe was left open; no pressure was needed. You may want to spray the tank olive drab for a better look.

(Continued on page 127)

CLASSIFIED

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WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

1930s to 1950s MODEL AIRPLANE MAGAZINES; 1930s aviation pulps, complete and good condition; $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

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GIANT SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid U.S., Foreign $20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

INTERNATIONAL AIRCRAFT RESEARCH—Need documentation? Include name of aircraft for availability of documentation with $3 for 3-view and photo catalogue. 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

WANTED: your old proportional radios; interested in pre-1980, American-made; C&S, Deans, Klinetronics Spar and others. Older is better. Ron Gwara, 21 Circle Dr., Waverly, NY 14892; (607) 565-7486.

JETS, the monthly newsletter for jet engines, Jet-X and pulsejets, $12 per year; $15 international. Back issues available. Catalogue, $5. DOYLEJET, P.O. Box 60311-A, Houston, TX 77205.

OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $2.95 S&H for first item; $1 for each additional item. *Foreign:* (including Canada and Mexico)—*surface mail*, add $4 for first item, $2 for each additional item; *airmail*, add $7 for first item, $2.50 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. Connecticut residents add 8% tax. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

R/C HELICOPTER TRADER. Published every other week. Helicopters, parts and accessories. For free copy, send SASE to P.O. Box 702, Arlington, TX 76004.

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $2 for large list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555. (619) 375-5537.

FOAM WING-CORES, floats, EPS blocks. All foam cut on Tekoa feather-cut system. Will cut to your specifications. Call or send to: SKY BLAZER PRODUCTS, 448 Vienna St., Newark, NY 14513; (315) 331-7464.

BUTTON-HEAD SHEET-METAL SCREWS—no. 2x1/2, $4.90 for 100; 4-40x3/4 alloy socket caps, $4.75 for 100. New, lower prices on metric socket caps. *Free catalogue*—contact Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (908) 806-4050; Fax (908) 788-2607.

NI-CD ANALYZER SOFTWARE for DOS. Ensure your batteries are delivering peak performance. Calculate capacity and plot discharge curves for voltage measurements collected during discharge tests. Complete instructions for collecting data and using program. Specify 3 1/2 or 5 1/4 disk. Send $20 to LAMANTIA PRODUCTS, P.O. Box 672, Station B, London, Ontario, Canada N6A 4Y4.

SIGNS • PLAQUES • BANNERS. Choose a sign for your shop, a name plaque for your display case or a banner for your club. For free brochure, send SASE to: Danco Signs, 425 E. Knightsbridge Pl., Lecanto, FL 32661.

MODEL MAGAZINES (1930 to present): *Air Trails, American Aircraft Modeler, Flying Aces, Flying Models, MAN, RCM* and others. Complete sets and spares available. David L. Brown, 61 Coach Rd., Glastonbury, CT 06033-3237; (203) 659-2412.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 3,300 different Foto-Paaks and 20,000+ drawings. Catalogue $4. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

MAGAZINE STORAGE FILES—get your collection in order. Send SASE for free information. Acorn Products, Box 56, Sabina, OH 45169.

NEVER BEFORE SEEN ON THIS PLANET! New R/C products! Serious VCR flight-instruction programs; awesome graphics; new kits; plus more! Need dealers. Public welcome!! *Silicon Valley R/C Technologies*, (800) 822-1500.

PLANS ENLARGED—scanning/plotting services; Windsoft dot-matrix plotter. Free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

CRASH-RESISTANT composites; 120 types of aircraft, boats and rocket engine kits. Send three stamps to WILLAIRCO, 2711 Piedmont Rd. NE, Atlanta, GA 30305.

HAND-LAUNCHED glider: 16 1/2-inch wingspan; contest quality. All sanding and shaping performed; detailed assembly and flying instructions included; $7.50 plus $2 S&H. S&I Parsons, Rt. 2, Box 581-E, Hiawassee, GA 30546; (404) 896-4267.

R/C WORLD—ORLANDO, FL, CONDO RENTAL—2 bedroom, furnished. Available weekly or monthly. Low rates, 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information, call Micki at 800-330-7243 or 407-260-1252 (fax, 407-331-3867), or write to: Page One Management Realty Inc., P.O. Box 4732, Winter Park, FL 32793-4732.

MODEL MAGAZINES, send $1 for list. B. Apgar, 18 Mt. Joy Rd., Milford, NJ 08848.

FIBERGLASS CLOTH: 3-ounce and 7-ounce, 38 inches wide, $1.50 per yard. J. Petersen, 1027 W. 30th St., Wichita, KS 67217.

USED ENGINES WANTED—ignition, glow, diesel. Send description and price for prompt reply. T. Crouss, 100 Smyrna St., West Springfield, MA 01089.

P/C—THE EASY WAY to simulate metal panels; $1 gets info and sample. Clarke Smiley, 23 Riverbend Rd., Newmarket, NH 03857.

AVIATION VIDEOS—the video history of aviation available through our catalogue: WW I, WW II, Korea, Vietnam, Persian Gulf and more. Send $5 to Oranian Video, P.O. Box 852, Woodbridge, NJ 07095.

WANTED: complete engines/parts for airplanes, outboards, race cars prior to 1960. Wes Pettinger, 1501 Banbury Ct., Richardson, TX 75082; (214) 669-4003 or 907-0930.

VACUUM-FORMING—do it yourself! New, 128-page, illustrated book shows you how. Make car bodies, helicopter canopies, airplane parts and boat hulls. Start with ultra-low-cost, basic setup, or form up to 1/8-inch-thick plastics with innovative two-stage vacuum system. Make a high-vacuum source for less than $6. Eight chapters, including plastics, molds, heat and vacuum sources, tips and examples. It's easy; try it! $9.95 (plus $1.05 postage). VACUUM FORM, 272 Morganhill Dr., Lake Orion, MI 48360; or call (24 hours) 800-737-3000, ext. 2 ($1 surcharge on VISA/MC orders).

HELICAT CHOPPER: with O.S. .28FH engine. Flown four times, never crashed. Futaba 7FG/E, Gold sticker, five S138 servos. Both, $425; without radio, $300. GMP Cobra with O.S. Max .50, stock head, $350; without engine, $225. Bill Griggs, P.O. Box 815, Baldwinsville, NY 13027; (315) 638-2058.

SMALL-SCALE PLANS—build a collection, not just a model. *Postwar Props* 1/12-scale series: Bearcat, Corsair, Sea Fury, Skyraider. Balsa construction—$8 each; $25 for all. Mike's Quad Models, 1116 13th Ave., Moline, IL 61265.

FREE BULLETIN BOARD: new electronic bulletin board for R/C modeling enthusiasts; 1200/2400 Baud support. (315) 652-5641.

ANTIQUE ENGINES, 1945-48—Drone Diesel, 1948, new, $180; McCoy 29 Red Head, 1948, Duro-Matic, ignition, Champion spark plug, excellent condition, $180; Mohawk 29 with tank, 1948, O&R glow plug, manual, good-to-excellent condition, $150; O&R 60 with tank, ignition, Champion spark plug, manual, original box, excellent condition, extra Champion spark plug, extra points, coil, condenser, battery box, $200. R. Hodge, 9 Woodland Ave., Coventry, RI 02816.

OLD TIMERS, 1968 or older—Super Tigre G.21/35 R/C (NIB), $120; Super Tigre G.21/46 Ring R/C (NIB), $130; Fox 60 R/C twin plug (NIB), $150; Testor's McCoy 19 R/C (NEW), $50; Andrew's Aeromaster Bipe kit (NIB), $160; Top Flite's Top Dawg kit (NIB), $50; Lanier's Bronco (NIB), $150. R. Hodge, 9 Woodland Ave., Coventry, RI 02816.

HOBBY STORES—Orlando, Florida. Two great locations. Priced below cost with $59,000 down. Health forces sale. Great opportunity. Call (407) 682-9600.

PEN-AND-INK AVIATION PRINTS. Detailed 8 1/2x11 lithographs only $5.95. Send long SASE for free, illustrated brochure. Gary Kalin, 1026 Timberfield Dr., Ballwin, MO 63021.

CLUB OF THE MONTH

The Whitley County Barnstormers
c/o John G. Smith, 1140 W. 500 North, Columbia City, IN 46725

One of the nicest parts of this job is that we get to read so many club newsletters. They're wonderful barometers of the modeling community across the country. One club that seems to have fair skies and a favorable long-range forecast is the Whitley County Barnstormers of Columbia City, IN. Editor John Smith writes with a flair that must entertain the members and keep them informed and motivated.

Smith reports the results of a survey that indicates that fun flys are more popular than pylon racing and pattern events. The club's agenda includes discussions about an improved field layout, safety fences, a larger pit area and a mowing schedule. Members are also concerned about transmitter-separation problems. Possible solutions include a taxiway that would be between the pilots' flying positions and the active runway. This would automatically place the faster (flying) models farther away from any frequency problem and minimize their susceptibility to interference. An interesting concept!

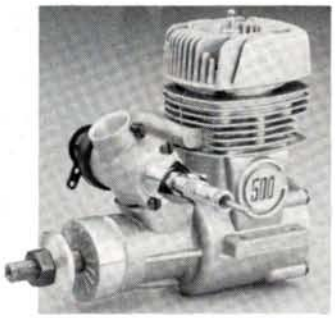
An engine review was also included; it contained information on rpm and prop selection.

The extended forecast looks favorable for this well-organized club. We hope they enjoy their two free subscriptions.

Newsletter editors! Please put us on your mailing lists! We'd like to see a lot more great material and may want to talk to you about reprints.

■

PRODUCT NEWS



GREAT PLANES
Super Tigre G-500

The Super Tigre G-500 was designed to re-establish Quickie 500 as a competitive class for all racers—even those who can't afford an expensive engine. It's a totally new design—.40 size—that's specially for racing; it isn't just a re-vamped version of an old engine. It doesn't require a special glow plug.

Price: $249.95

Great Planes Model Distributors, 1608 Interstate Dr., Champaign, IL 61821; (217) 398-3630.

BYRON ORIGINALS
AT-6 Texan

Known as the Army/Air Force AT-6 and as the Navy/Marine SNJ, the Texan has long been popular with scale modelers. This kit's plug-in, wire-cut, foam wings come with all sheeting, and they're easy to build and transport. The kit includes: center and wing flaps; pressure-sensitive, fuel-resistant, Mylar decals; die-cut wood; molded ABS detailing; all the wood for the conventional rudder and elevators; molded, clear canopy; partial cockpit; steerable tail-wheel assembly; fuel system; complete hardware package. Performance-matched options include a choice of power package, retractable main gear, earlier six-panel canopy, scale Byron 5 1/4-inch tires and pneumatic support equipment. Specifications: wingspan—101 inches; length—71.5 inches; weight—28 to 29 pounds; radio required—6-channel (with flaps).

Price: $499.95 (plus $19 S&H)

Byron Originals Inc., P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165.

ROYAL PRODUCTS
Deluxe Escort Field Box

Made of top-quality, machine-cut, 1/4-inch-thick mahogany plywood, this new field box is unique because the starting and fueling modules can be detached from the main box and attached to each other. It also has adjustable padded cradles and a vented battery compartment that's large enough for standard or oversize 12V wet cells. It has a large, easy-to-grip carrying handle and includes all the necessary hardware and rubber feet.

Price: $52.95

Royal Products Corp., 790 W. Tennessee Ave., Denver, CO 80223; (303) 778-7711.

MIDWEST PRODUCTS
Midwest Sukhoi .40

This new "Success Series" .40 model promises high performance and high quality. It includes: a "Success Series" construction manual; a computer-drawn plan; micro-cut, high-quality balsa parts; a vacuformed cowl; a crystal-clear canopy; a specially formed aluminum landing gear with axles; a decal sheet and more! Specifications: wingspan—54 inches; engine—.35 to .45 2-stroke or .40 to .50 4-stroke; flying weight—5 to 5 1/2 pounds.

Part no. 173

Price: $134.95

Midwest Products Co. Inc., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342; (219) 942-1134.

FUTABA
YS Futaba 120AC

The newest, most powerful YS Futaba engine—the supercharged, fuel-injected, 4-stroke YS 120AC—is ideal for F3A aerobatics and scale competition. It has a special air chamber, crankcase pressure and a double throttle valve to increase the fuel/air charge (much like a tuned intake manifold). Its unique engineering offers superior performance during steep climbs or inverted flight, and it isn't susceptible to 4-stroke detonation.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

JB MODELS
Junkers J-10

The Junkers J-10 (CL-1) WW I giant-scale sport model is designed for beginners in giant scale, but it's also an excellent low-wing trainer. The kit contains all the balsa and plywood needed for construction, and hardware, hand-cut parts, bent landing gear, building instructions and rolled plans are also included. No special skills are required to build or fly this model. Specifications: wingspan—80 inches; weight—7 to 10 pounds; engine—.70 to .90 2-stroke or .80 to .20 4-stroke.

Price: $79 (plus $4.50 S&H and sales tax in NY)

JB Models, 9 Cornell Ave., Red Hook, NY 12571; (914) 758-1103.

Descriptions of products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**.

A-10

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FLIGHT PERFORMANCE

The model is hand-launched and, because the horizontal stab is low, you must get your hand down and out of the way as soon as you let go of the model. The A-10 is extremely stable. Aileron control is smooth and predictable and rolls are easily performed. The model doesn't drop a wing when it stalls; it simply "mushes" forward and drops its nose. Loops are easy to execute, with a slight dive to pick up the additional speed needed. Owing to its light wing loading and high-lift airfoil, glides are flat when the engines sign off. Level flight can be maintained with one engine out; and single-engine performance is very good; you can even turn into the dead-engine side without fear.

The engines start easily. I've found that the first engine started should be set on the rich side because it will lean out when the second engine is started (because they're fed by the same fuel tank).

CONCLUSION

Install your favorite radio and go! I strongly suggest that you break-in both engines before you attempt the first flight. To this end, you may want to consider one of the after-market carburetors; the needle-valve threads are much finer, allowing for more accurate adjustment. On the prototype, cut-down Cox 5x3 props were used. I'm currently experimenting with two three-blade 5x3 props cut down and placed one on top the other to form a six-blade fan prop. Though the props are enclosed in the engine housing, have respect for the damage it can do.

Keep the control throws to a minimum. Adjust the elevator so that you have 1/8 to 1/4 inch each way. For the ailerons, use the same numbers. The amount of control throw you use should be based on your flying skill. Once the engines have cut out, keep the nose down and get the plane pointed back toward the runway.

From having the dream to seeing my plane completed, the A-10 project has been a true joy—one I'll never forget. One of the great aspects of this hobby is the experimentation. Why not try a pair of hot .09s with three-liter soda bottles; or maybe a couple of electric motors, placing the battery over the wing. If you really don't want the hassle of two engines, how about sticking a .25 engine in the nose; maybe retracts? Who knows? To the folks at *Model Airplane News*, one great big thanks! And to everybody out there: keep the faith; believe. Who cares if it hasn't been done yet, give it a try! You might be the guy who makes it happen. Happy building.

**Here are the addresses of the companies mentioned in this article:*
***Cox Hobbies,** 350 W. Rincon St., Corona, CA 91720.*
***Coverite,** 420 Babylon Rd., Horsham, PA 19044.*
***Pactra Inc.,** 620 Buckbee St., Rockford, IL 61104.*
***Pacer Technology and Research,** 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.* ■

SMART CHARGER

(Continued from page 122)

surements, i.e., with retarded, neutral and advanced timing. This can give you a simple efficiency comparison. You'll find that your most powerful motor is rarely your most efficient one.

Look carefully at the total rpm compared with the amperage draw; this has a lot of bearing if your next plane is a "duration design" instead of a "rocket sled" with short flights. This application of the Smart Charger has been the most valuable one since it came into my shop. I now feel very comfortable with the speed controller, propeller and motor combinations that I'm using on my aircraft.

INSTRUCTIONS

The charger's instructions are well written. The first half of the manual is purely an overview of the unit's capabilities. It's worth reading so that you don't overlook any of the charger's many functions.

The second half of the manual explains, in detail, how to operate the unit. It describes every step of each of the charger's functions. Although the instructions are basic, they show a lot of common sense in how they address potentially dangerous tasks. For example, some people aren't aware that connecting a charger to an automobile battery can be hazardous. The instructions not only explain why, but they also suggest how to avoid the same type of problem using the charger or any other piece of equipment you may own.

Take the time to read the entire manual. You'll probably only need to do so once. A careful read will help you to get the most out of your unit.

USING THE AC POWER SUPPLY

The charger comes with an optional Hitec AC power supply. It does the job but, for peak-charging, you really have to keep the current below 1.5 amps or it will trip the unit. When this happens, the unit won't give you a low-voltage warning as it does when it's hooked up to a sagging auto battery. Instead, owing to a low-current situation, it trips, and this resets the Smart Charger to its basic display.

Using this unit as an ammeter or in one of its slow-charging modes is fine, and it's preferable to lugging a 12V battery around your workshop.

CONCLUSION

As you can tell, I've found numerous uses for this system, and I expect that there are plenty more. Next, I want to set up a thrust stand so that I can measure propeller performance while carefully watching the current draw.

SR certainly has a winner with this unit. It's

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NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to Eric Gancarz for correctly identifying the mystery plane in the May '92 issue. Eric's entry was chosen from 62 correct replies. The McDonnell FH-1 Phantom was first flown in 1945, and it was the Navy's first carrier-based jet fighter. The prototype was designated as XFD-1, and within a year of its development, the FH-1 was in full production. Though 100 were approved for production, only 60 were delivered. This was also the first contract that McDonnell received for an aircraft that it had designed. Powered by two Westinghouse J30-WE-20 turbojets, the Phantom had a wingspan of 40 feet, 9 inches and a length of 38 feet, 9 inches. Maximum speed was 505mph, and it had a combat range of 690 miles at a maximum weight of 12,035 pounds. The aircraft was armed with four .50-caliber machine guns and eight zero-length rocket launchers mounted under the wing. Though its service life was relatively short, the fact that the Phantom was the first successful carrier-based jet fighter ensures the design a place in naval-aviation history. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

ADVERTISER INDEX